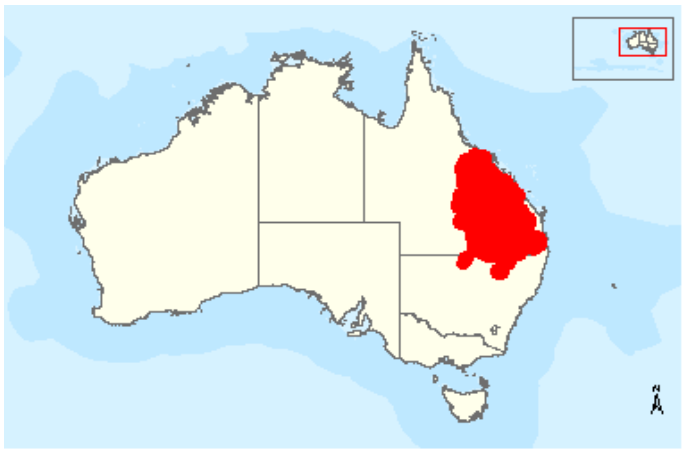
## 4.5 TEC Management Plans and Extent of Occurrence Maps

### 4.5.1 Acacia harpophylla dominant and co-dominant (Brigalow)

**Threatened Ecological Community Management Plan 1**

***Acacia harpophylla* dominant and co-dominant (Brigalow)**

Brigalow Ecological Community (Photo: Unidel)



Brigalow distribution map (DoE, 2011)

**EPBC Act Legal Status**

Endangered

**VM Act Conservation Status**

Endangered

The REs that comprise these communities are listed as REs 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14 and 11.12.21.

**Known Distribution**

Occurs in the Brigalow Belt Biogeographic Region. This bioregion is a large and complex area covering 36,400,000 ha. Eighty percent of the bioregion lies within Queensland, the remainder lies within New South Wales. The bioregion stretches up north to Townsville in Queensland extending south of Dubbo in central-western New South Wales.

The Brigalow TEC is made up of 16 regional ecosystems, all of which are listed as 'endangered' under the VM Act.

**Occurrence within Development Area**

Within the develoment area, the Brigalow communities occur on fertile soils and consist primarily of remnants which are small and narrow, occurring along fence lines, creeks and roadsides. Brigalow is dispersed throughout the development area.

The potential distribution of Brigalow communities mapped by DEHP within the development area is provided below and illustrated on the **Plan 1** - **Extent of TEC map** following the TEC profile.

Brigalow for the purposes of this SSMP and the application of QGC Constraints Planning and Field Development Protocol means the presence of Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community, including Brigalow regrowth, that retains the species composition and structural elements typical of that found in the undisturbed listed regional ecosystems but does not include:

1. Vegetation that has been comprehensively cleared (not just thinned) within the last 15 years;
2. Vegetation in which exotic perennial plants have more than 50% cover, assessed in a minimum area of 0.5ha (100 m by 50 m); and
3. Individual patches of Brigalow that are smaller than 0.5ha.

Brigalow regrowth that retains the species composition and structural elements typical of that found in the undisturbed listed regional ecosystems is considered to be part of the listed Brigalow ecological community (Environment Australia, 2001). Such regrowth will usually be 15 years or more old and in Queensland, typically can be identified as High Value Regrowth.

**Extent of Ecological Community Fragmentation in the Region**

This TEC is now highly fragmented due to extensive clearing within the Brigalow Belt South Bioregion, often occurring as small linear patches along roadsides, fence lines and the edges of paddocks. The Brigalow fragments are now mostly located within substantially modified landscapes, occur adjacent to uncleared eucalypt woodlands, occupy small clay pans or the toe-slopes of jump-ups and escarpments (Butler 2007). Brigalow occurs scattered throughout the development area often in narrow linear strips. The minimum patch size for Brigalow TEC is 0.5ha. QGC will avoid clearing of Brigalow TEC. Where clearing is unavoidable QGC will seek to maintain connectivity to the patch of Brigalow TEC.

**Description of the relevant characteristics of the Ecological Community**

This TEC is characterised by the presence of Brigalow as one of the three most abundant tree species. Brigalow is usually either dominant in the tree layer or co-dominant with other species such as Belah (*Casuarina cristata*), or other species of *Acacia*, or species of *Eucalyptus* (Butler 2007). Occasionally Belah or species of *Acacia* or *Eucalyptus* may be more common than Brigalow within the broad matrix of Brigalow vegetation. The structure of the vegetation typically consists of open forest. The height of the tree layer varies from 9m in low rainfall areas to 25m in higher rainfall areas. A prominent shrub layer is usually present (Butler 2007).

Brigalow also occurs in mixed communities in some regions and is commonly associated with several other woody species, including overstorey species such as Coolabah (*Eucalyptus coolabah*), Dawson Gum (*Eucalyptus cambageana*), Belah, and a range of understorey species (Butler 2007). Boree (*Acacia tephrina*), Georgina gidgee (*Acacia georginae*) and Black Gidyea (*Acacia argyrodendron*) also occupy similar habitats and have similar habits and growth forms, but are less widespread, while a number of other *Acacia* species also form structurally similar communities (Butler 2007).

REs corresponding with Brigalow (*Acacia harpophylla* dominant and co-dominant) in the development area include: 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14 and 11.12.21

The listing of the Brigalow community under the EPBC Act did not distinguish between remnant and regrowth Brigalow. Remnant woody vegetation under the VM Act is defined as:

> "Woody vegetation is mapped as remnant where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy. An undisturbed stratum (or layer) is defined as one that shows no evidence of extensive mechanical or chemical disturbance (logging, clearing, poisoning, etc.) evident in field inspections or on the

available historical aerial photographic record."

High-value regrowth vegetation is mature native vegetation that has not been cleared since 31 December 1989.

Not all vegetation in which Brigalow is a prominent component is included within the listed ecological community. Within the project development area (Brigalow Belt Bioregion), the following regional ecosystems may have *Acacia harpophylla* as a prominent component but are not included in the Brigalow ecological community listed under the EPBC Act: 11.3.17, 11.9.10, 11.9.11 and 11.11.16.

## Biology and Reproduction

Dominant species are mainly *Acacia harpophylla* and *Casuarina cristata*, and so the overall biology of the community reflects patterns of seasonal growth and flowering as determined by these species. Brigalow has been extensively cleared for agriculture and grazing throughout the area. In areas where initial clearing has occurred without follow-up, Brigalow is able to slowly re-establish, suckering from the roots systems of the original plants. This regrowth offers an opportunity for the acquisition of offsets and recovery of the community in disturbed areas. Brigalow is difficult to re-establish once it has been totally eradicated from an area.

Brigalow seeds generally remain viable for less than a year, even under controlled conditions, and thus seedlings are relatively rare in natural landscapes and are likely to be produced in large numbers only in exceptional years (Butler 2007).

Brigalow trees are known to sucker relatively easily from their roots and re-sprout after damage (Butler 2007). This re-sprouting is, however, dependant on the root stocks remaining intact (Johnson 1997; Benson *et al*. 2006). The suckers are reported to grow far more rapidly than Brigalow seedlings (Johnson, 1964). Brigalow trees have a well-developed lateral root system, with the horizontal roots storing large quantities of starch that enable rapid suckering (Johnson 1964).

Trees and suckers are often joined by horizontal roots and form dense colonies (Johnson 1964). The extent of suckering in Queensland depends on seasonal conditions, tree size and age and the level of damage to the tree, with dry conditions, younger trees and severe damage promoting more suckering than wet conditions, older trees or less damage (Johnson 1964).

## Preferred Habitat and Microhabitat

This community occurs on heavy clay soils that often have very poorly developed drainage patterns. In deeper soils, the community forms on undulating surfaces with frequent gilgais or melon-holes where water accumulates after rain. Deep cracks are also characteristic in these areas as the soils dry out, affording shelter for various mammals and reptiles. On hills and other better drained areas, soils are more shallow and often with a greater coverage of lateritic gravel or scattered stones. The soils usually have a clay field texture throughout the profile, are relatively fertile and tend to have high salt content (Bui and Henderson 2003). This community typically occurs on better quality soils in the Walloons area.

Throughout the development area, the smaller areas of this community were generally found to be degraded due to edge effects including weed invasion and fire damage.

## General Threats

Clearing for agriculture, grazing or other development.

Establishment of weeds particularly grasses such as Buffel Grass, which can lead to an increase in fuel loads and associated fire damage along the margins of this fire sensitive community.

The establishment of other weeds such as Mother-of-Millions and Tree Pear also degrades the overall species composition in these communities, although it is doubtful that these species cause any serious

ecological harm unless they occur in large numbers.

**Project Specific Threats**

Project specific threats on Brigalow communities are presented in **Section 4.4.2**.

**Management Strategies**

Areas of Brigalow TEC and REs have been mapped under the Protocol as No Go or Very High Constraints requiring that they are avoided or clearing minimised.

The key management strategy is to clearly identify these areas in the Protocol and on site, and avoid clearing and disturbance to the greatest extent possible. QGC will aim to clear less than the approved limit.

A Site Specific Environmental Management Plan will be prepared prior to clearing by the approved contractors that will identify appropriate management and mitigation measures. Where practicable infrastructure will be re-aligned or positioned to avoid impact to this TEC.

**Mitigation Measures**

General mitigation measures to minimise Project impacts on Brigalow communities is presented in **Section 4.4.3**.

**Rehabilitation and Recovery**

Rehabilitation and recovery measures to minimise Project impacts on Brigalow communities are presented in **Section 4.4.3**. In addition Brigalow habitat rehabilitation will be encouraged through natural sucker regrowth.

**Performance Measures**

Performance measures are detailed in Section **4.4.35.**

**Monitoring**

Monitoring required under this TEC Management Plan is presented in **Section 4.4.36**.

**References**

Benson, J.S., Allen, C.B., Togher, C., and Lemmon, J. (2006). New South Wales Vegetation Classification and Assessment: Part 1 Plant communities of the NSW/Western Plains. *Cunninghamia* 9: 383-450 and accompanying CD.

Butler, D.W. (2007). *Recovery Plan for the "Brigalow (Acacia harpophylla dominant and co-dominant" Endangered Ecological Community* (draft of 1 May 2007). Report to the Department of the Environment and Water Resources, Canberra. Queensland National Parks and Wildlife Service, Brisbane.

Bui, E.N. and Henderson, B.L. (2003). Vegetation indicators of salinity in northern Queensland. *Austral Ecology* 28: 539-552.

Environment Australia (2001*) Brigalow Regrowth and the Environment Protection and Biodiversity Conservation Act 1999*, accessed December 2002.

Department of the Environment and Heritage (DEH) (2005). Brigalow Regrowth and the Environment Protection and Biodiversity Conservation Act, Nationally threatened species and ecological communities.

Department of Sustainability, Environment, Water, Population and Communities (DoE) (2011). 'SPRAT database for Brigalow (*Acacia harpophylla* dominant and co-dominant)' Commonwealth Canberra. Accessed 5 September 2011.

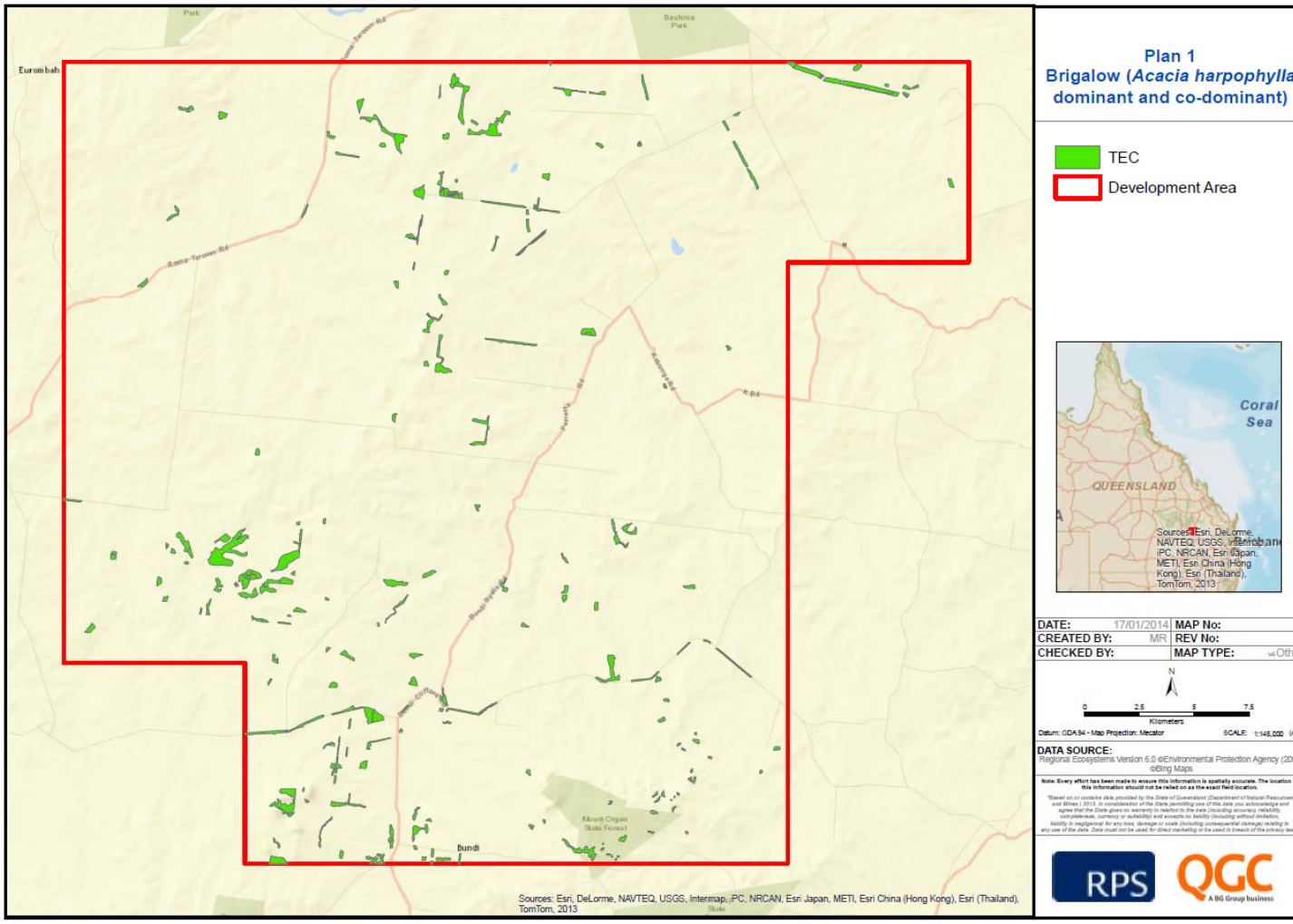
Johnson, R.W. (1964). *Ecology and Control of Brigalow in Queensland*. Queensland Department of

Primary Industries.

Johnson, R.W. (1997). The impact of clearing on Brigalow communities and consequences for conservation. In P Hale and D Lamb (eds), *Conservation outside nature reserves, Centre for Conservation Biology*, The University of Queensland, Brisbane, pp 359-63.

Plan 1 – *Acacia harpophylla dominant and co-dominant (Brigalow)*

## Plan 1: Brigalow Extent of Occurrence Map




Plan 2 – *Semi-evergreen Vine Thickets of the Brigalow Belt (North and South) and Nandewar Bioregions*

### 4.6.7 Homopholis belsonii (Belson's Panic Grass)

**Significant Species Management Plan 5**

***Homopholis belsonii (Belson's Panic Grass)***

*Homopholis belsonii* (Photo: Boobook Pty Ltd)

*Homopholis belsonii* distribution (DoE 2011)

**EPBC Act Conservation Status**

Vulnerable

**NC Act Conservation Status**

Endangered

**Known Distribution**

The distributional range of *Homopholis belsonii* lies within the Brigalow Belt South Biogeographic Region, Queensland (area is over 200 km by 400 km). There have been 55 records on the Darling Downs and 1 in Maranoa region (Herbrecs 2013). This species also occurs on the north west slopes and plains of New South Wales (Trémont and Whalley 1993; Menkins 1998). Known records within the development area and indicative habitat for this species are mapped below.

**Occurrence within Development Area**

There is one record for this species occurring within the southern portion of the development area. However, indicative habitat has been mapped for this species using RE associations, as presented in **Plan 5**.

**Description and Relevant Characteristics**

Belson's Panic Grass is a tufted grass to 40cm tall with sparsely branched lateral branches stems and silky membranous ligules to 1.5mm long. Its leaves are flat and smooth to 15cm long and 4.5mm wide (Sharp and Simon 2002). Flowers are compound, open, stiff panicles to 25cm long and 0.35cm wide with solitary, 2-flowered, lanceolate and dorsally compressed spikelets to 6.1mm long (Sharp and Simon 2002). Lower floret sterile, upper bisexual; lower glume well developed, ± as long as spikelet, 7-nerved, upper glume ± as long as spikelet, 7-nerved; lower floret with lemma about as long as spikelet, palea

minute, bilobed; upper floret with lemma ½ - ¾ length of spikelet, 507 nerved, palea about as long as lemma; stamens 3; styles distinct (Stanley and Ross 1983).

## Biology and Reproduction

Flowering February-May (Sharp and Simon 2001) and possibly November to December. Fruiting recorded in February (Leigh *et al*. 1984).

A rhizomatous and stoloniferous perennial grass. Generally a colony former (Menkins 1998), it spreads by stolons and can form colonies in a matter of months (Menkins 1998).

The species may have the ability to recolonise cleared or highly disturbed areas, since it is found in regenerating vegetation on roadsides (Menkins 1998). The exact length of seed viability is currently not known; however initial trials have indicated that it germinates readily without the need for a dormancy period (Menkins 1998; Trémont and Whalley 1993).

## Preferred Habitat and Microhabitat

In Queensland it is found in areas of light to moderate shade beneath or beside trees, principally in the soils and plant communities of the *Eucalyptus populnea* (Poplar Box) woodlands (Leigh *et al.* 1984; Menkins 1998). These woodlands occur on level terraces on rock-free, clay loam soils that are not prone to regular flooding (Fensham 1998), which have an understorey of *Geijera parviflora* (Menkins 1998). Also found in the shadier areas of *Acacia melvillei, Acacia pendula* and *Acacia harpophylla* communities and in *Eucalyptus orgadophila (*Mountain Coolibah) communities though far less commonly, and on roadsides (Menkins 1998). Soils typical of the lighter- textured clays of the Poplar Box woodlands, grey to brownish-red in colour, basalt derived, and most commonly with a notable sand or gravel content (Leigh *et al.* 1984; Menkins 1998). REs likely to support *H. belsonii* include: 11.3.1, 11.3.1b, 11.3.1d, 11.3.2, 11.3.2a, 11.3.2b, 11.3.17, 11.4.3, 11.4.3a, 11.4.3b, 11.4.7, 11.9.5, 11.9.5a and 11.9.6. Short desctiptions of these REs are presented in the table below.

| RE | Short Description |
|---|---|
| 11.3.1<br>11.3.1b<br>11.3.1d | *Acacia harpophylla* and/or *Casuarina cristata* open-forest on alluvial plains |
| 11.3.2<br>11.3.2a<br>11.3.2b | *Eucalyptus populnea* woodland on alluvial plains |
| 11.3.17 | *Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains |
| 11.4.3<br>11.4.3a<br>11.4.3b | *Acacia harpophylla* and/or *Casuarina cristata* shrubby open-forest on Cainozoic clay plains |
| 11.4.7 | *Eucalyptus populnea* with *Acacia harpophylla* and/or *Casuarina cristata* open-forest to woodland on Cainozoic clay plains |
| 11.9.5<br>11.9.5a | *Acacia harpophylla* and/or *Casuarina cristata* open-forest on fine-grained sedimentary rocks |
| 11.9.6 | *Acacia melvillei* +/- *A. harpophylla* open-forest on fine-grained sedimentary rocks |

## General Threats

Threatening processes include clearing of habitat for agriculture, development or pasture improvement, overgrazing of habitat by domestic stock and invasion of habitat by introduced weeds. *Megathyrsus maximus* var. *trichoglume* (Green Panic Grass) appears to have either diminished or completely taken over potential *Homopholis belsonii* habitat at several locations in Darling Downs district, Queensland (Menkins 1998).

## Project Threats

There is one record of *Homopholis belsonii* within the southern portion of the development area. Potential threats to this species related to the Project phases may include:

### Development Threats

- Clearing of individuals for infrastructure including access tracks, installation of well heads and flow lines and any other infrastructure;
- Indirect impacts from the inadvertent introduction of weeds which might compete with seedlings;
- Habitat erosion from incremental loss of habitat and habitat quality due to too frequent fire or too intense fire;
- Changes to surface hydrological regimes resulting from earthworks for well pad establishment leading to sedimentation;
- Pollution of surface hydrological flows associated with pollution from salinity, or hydrocarbons associated with water extracted during well establishment;
- Installation of artificial watering points (well ponds) resulting in an increase in potential herbivores including goats, rabbits and macropods leading to damage and grazing pressures; and
- Potential for accidental fire ignitions resulting in too frequent fire or too intense fire leading to seed and juvenile plant destruction. Accidental fire ignitions may be associated with construction activities.

### Operational Threats

- Maintenance works leading to clearing outside project footprints with a potential loss of individuals;
- Sedimentation, increased salinity and pollution of surface water flows associated with operational aspects of project infrastructure;
- Habitat erosion from alterations, associated with infrastructure, to surface hydrological regimes; and
- Accidental fire ignitions associated with maintenance activities (hot vehicle exhausts by field crew, and other welding or metal cutting equipment).

### Decommissioning Threats

- Accidental fire ignitions associated with decommissioning activities (hot vehicle exhausts and other metal cutting equipment); and
- Sedimentation, increased salinity and pollution of surface water flows associated with decommissioning of the project involving rehabilitation of well pads and right of ways (access tracks).

## Management Strategies

The primary management strategies are:

- The identification and avoidance of known locations and likely habitat area during construction;
- Activities to educate field personnel in identification will assist in locating additional occurrences and avoiding those areas;
- All vehicles and field personnel will remain within the ROW and designated access tracks;
- Where possible, no *H. belsonii* individuals will be cleared during the operational phase;

- Weed control and reducing spread of weeds that may impact on regeneration;
- To implement a fire regime to reduce the incidence of uncontrolled or hot fires.

In the event *H. belsonii* is detected in the development area, refer to **Section 4.1** for the recommended management strategies.

**Mitigation Measures**

Mitigation measures to minimise Project impacts on *H. belsonii* are presented in **Section 4.6.2.**

**Rehabilitation and Recovery**

*H. belsonii* general rehabilitation and recovery measures are presented in **Section 0**.

**Performance Measures**

Performance measures are presented in **Section 04**.

**Monitoring**

Monitoring required for this species is presented in **Section 0**.

**References**

Department of Sustainability Environment Water Population and Communities (DoE) (2008). Approved Conservation Advice *Homopholis belsonii*, s266B of the Environment Protection and Biodiversity Conservation Act 1999.

Department of Sustainability, Environment, Water, Population and Communities (DoE) (2011). *Homopholis belsonii in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities*, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 8 September 2011.

Fensham R.J. (1998). *The grassy vegetation of the Darling Downs, southeastern Queensland, Australia. Floristics and grazing effects*. Biological Conservation 84 (3): 301-310.

Herbrecs November 2013. Available from: https://data.qld.gov.au/dataset/census-of-the-queensland-flora-2013/resource/e26b71cb-6cda-422a-b68d-aee19a87ed7a

Leigh, J., Boden, R., and Briggs, J. (1984). *Extinct and endangered plants of Australia*. Macmillan Company of Australia Pty. Ltd., Melbourne.

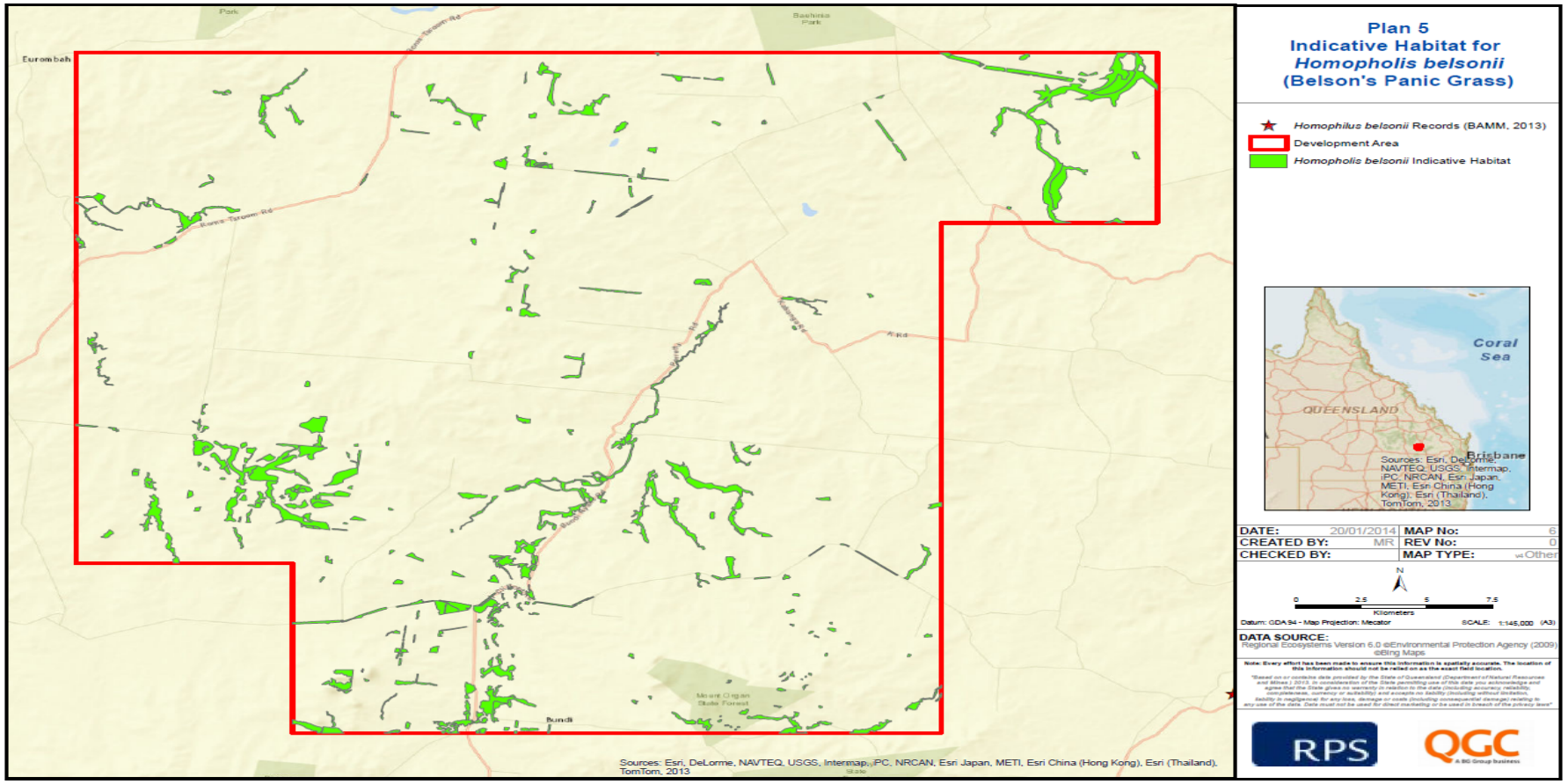
Menkins, I. (1998). *Draft Report for survey of Homopholis belsonii* C.E. Hubb on the Darling Downs. Toowoomba and Region Environment Council Inc.

Sharp, D. and Simon, B.K. (2002). *AusGrass: Grasses of Australia*. CD-ROM, Version 1.0. Australian Biological Resources Study, Canberra, and Environmental Protection Agency, Queensland.

Stanley, T.D. and Ross, E.M. (1983). Flora of south-eastern Queensland. Volume One.

Trémont R.M. and Whalley, R.D.B. (1993). *Draft final report for survey for Homopholis belsonii*. Department of Botany, University of New England, Armidale, NSW.

## Plan 5: Benson's Panic Grass Indicative Habitat map




Plan 5 – *Homopholis belsonii (Belson's Panic Grass)*

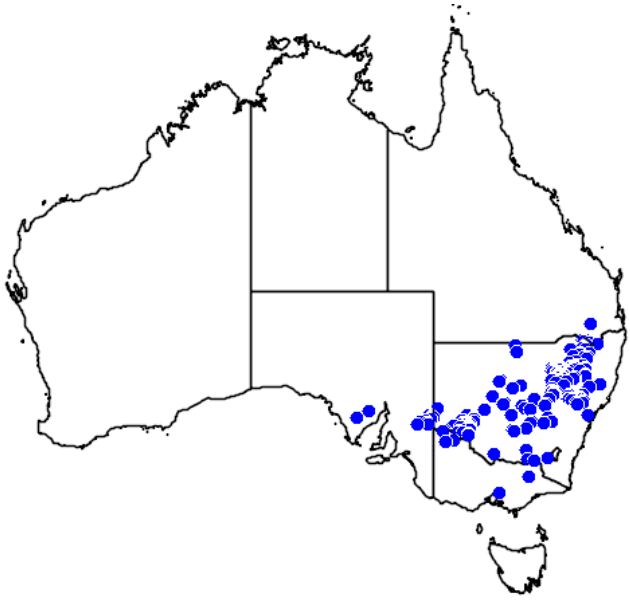
### 4.7.4 Mammals - bats

### 4.7.4.1 Nyctophilus corbeni (South-eastern Long-eared Bat) previously known as N. timoriensis

**Significant Species Management Plan 12**

***Nyctophilus corbeni* (South-eastern Long-eared Bat)**

*Nyctophilus corbeni* (Photo: Bruce Thomson)



*Nyctophilus corbeni* distribution (Atlas of Living Australia 2013)

**EPBC Act Conservation Status**

Vulnerable

**NC Act Conservation Status**

Vulnerable

**Known Distribution**

The South-eastern Long-eared Bat was formerly considered to be a distinct form of the Greater Long-eared Bat *Nyctophilus timoriensis* complex (Parnaby 1988; Duncan *et al*. 1999). This former taxonomy is reflected in the common and scientific names under which the species is listed in State nature conservation legislation, and in the scientific literature. However, the species was very recently formally described as a separate species and is now called, *Nyctophilus corbeni* (Parnaby 2009).

The South-eastern Long-eared Bat is found from eastern South Australia, through the slopes and plains of New South Wales and into central southern Qld. Throughout its distribution it appears to be uncommon with scattered populations (Turbill and Ellis 2006).

Records also indicate populations in River Red Gum (*Eucalyptus camaldulensis*) forests along the Murray River (Law and Anderson 1999). In Queensland, the South-eastern Long-eared Bat is mainly recorded in the Brigalow Belt South Bioregion, extending eastwards to the Bunya Mountains National Park. It has been recorded as far north as the Expedition Range and Dawson River areas. Its westerly range extends into the Mulgalands Bioregion and west of Bollon. There are limited records in Victoria, with patchy distributions in the Northern Plains and Mallee regions (Lumsden 1994; Koehler 2006).

Indicative habitat has been mapped for this species using RE associations. The map is contained in **Plan 12: South-eastern Long-eared Bat indicatvie habitat**.

## Occurrence within Development Area

Once specimen was recorded in the southern portion of the Gas Field in the Condamine State Forest. This species has also been recorded within 25kms of Gurulmundi State Forest (DEHP 2013). Indicative habitat has been mapped for this species using RE associations, as presented in **Plan 12**.

## Description and Relevant Characteristics

The South-eastern Long-eared Bat has a head and body length of 50-75 mm and a tail length of 35-50 mm. This species is distinguishable from other long-eared bats by its larger size as well as a broader skull and jaw. It is also geographically separated from other long-eared bats (Van Dyck and Strahan 2008).

## Biology and Reproduction

The South-eastern Long-eared Bat is an insectivorous bat. Food can be taken in flight, by gleaning vegetation or ground foraging (Lumsden and Bennett 2000; Van Dyck and Strahan 2008). In flight, it commonly feeds on beetles, bugs, and moths (Lumsden and Bennett 2000); however, it has also been recorded feeding on grasshoppers and crickets.

Foraging activities are concentrated around patches of trees in the landscape. Individuals appear to have defined foraging areas which they return to; they do not defend foraging areas and many individual from different species may share the same area.

There is little information currently available on this species' reproductive biology. Pregnant and lactating females have been trapped in November in central-western New South Wales and Queensland suggesting a similar breeding cycle to other sympatric long-eared bat species (Schulz and Lumsden 2010).

## Preferred Habitat and Microhabitat

The South-eastern Long-eared Bat occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands (DoE 2011).

The species also occurs in Bull-oak woodland, Brigalow woodland, Belah woodland, Smooth-barked Apple, *Angophora leiocarpa,* woodland; River Red Gum, *Eucalyptus camaldulensis,* forests lining watercourses and lakes (DoE 2011).

Throughout inland Queensland, the species habitat is dominated by various eucalypt and bloodwood species, and various types of tree mallee with it being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer (Lumsden 1994; Parnaby 1995; Ellis *et al.* 1999; McFarland *et al.* 1999; Dominelli 2000; Koehler 2006; Turbill and Ellis 2006).

There are a small number of records from closed forest adjacent to dry sclerophyll woodlands; in Araucarian notophyll vine forest in the Bunya Mountains and in semi evergreen vine thickets on the banks of the Dawson River and in the Brigalow Belt Bioregion (Pennay 2002; Venz *et al.* 2002).

REs likely to provide potential habitat for this species includes; 11.3.1, 11.3.1b, 11.3.1d, 11.3.2, 11.3.2a, 11.3.2b, 11.3.14, 11.3.17, 11.3.18, 11.3.19, 11.3.26, 11.4.3, 11.4.3a, 11.4.3b, 11.4.7, 11.4.10, 11.4.12, 11.4.12a, 11.5.1, 11.5.1a, 11.5.4, 11.5.4a, 11.5.5, 11.5.5a, 11.5.5c, 11.5.20, 11.5.21, 11.7.1, 11.7.4, 11.7.4c, 11.7.6, 11.7.7, 11.8.3, 11.9.1, 11.9.4, 11.9.4a, 11.9.4c, 11.9.5, 11.9.5a, 11.9.7, 11.9.7a, 11.10.1, 11.10.1a, 11.10.1d, 11.10.3, 11.10.7, 11.10.7a, 11.10.9, 11.10.11 and 11.10.11a. Short descriptions of these REs are presented in the table below.

| RE Code | Short Description |
|---|---|

| | |
|---|---|
| 11.3.1<br>11.3.1b<br>11.3.1d | *Acacia harpophylla* and/or *Casuarina cristata* open-forest on alluvial plains |
| 11.3.2<br>11.3.2a<br>11.3.2b | *Eucalyptus populnea* woodland on alluvial plains |
| 11.3.14 | *Eucalyptus* spp., Angophora spp., *Callitris* spp. woodland on alluvial plains. |
| 11.3.17 | *Eucalyptus populnea* woodland with *Acacia harpophylla* and/or Casuarina cristata on alluvial plains |
| 11.3.18 | *Eucalyptus populnea*, *Callitris glaucophylla*, *Allocasuarina luehmannii* shrubby woodland on alluvium |
| 11.3.19 | Callitris *glaucophylla*, *Corymbia* spp. and/or *Eucalyptus melanophloia* open-forest to woodland on Cainozoic alluvial plains |
| 11.3.26 | *Eucalyptus moluccana* or *E. microcarpa* woodland to open-forest on margins of alluvial plains |
| 11.4.3<br>11.4.3a<br>11.4.3b | *Acacia harpophylla* and/or *Casuarina cristata* shrubby open-forest on Cainozoic clay plains |
| 11.4.7 | *Eucalyptus populnea* with *Acacia harpophylla* and/or *Casuarina cristata* open-forest to woodland on Cainozoic clay plains |
| 11.4.10 | *Eucalyptus populnea* or *E. woollsiana*, *Acacia harpophylla*, *Casuarina* cristata open-forest to woodland on margins of Cainozoic clay plains |
| 11.4.12<br>11.4.12a | *Eucalyptus populnea* woodland on Cainozoic clay plains |
| 11.5.1, 11.5.1a | *Eucalyptus crebra*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sandplains/remnant surfaces |
| 11.5.4, 11.5.4a | *Eucalyptus crebra*, *Callitris glaucophylla*, *C. endlicheri*, *E. chloroclada*, *Angophora leiocarpa* on Cainozoic sandplains/remnant surfaces. Deep sands |
| 11.5.5,<br>11.5.5a,<br>11.5.5c | *Eucalyptus melanophloia*, *Callitris glaucophylla* woodland on Cainozoic sandplains/remnant surfaces. Deep red sands |
| 11.5.20 | *Eucalyptus moluccana* and/or *E. microcarpa*/ *E. woollsiana* +/- *E. crebra* woodland on Cainozoic sandplains |
| 11.5.21 | *Corymbia bloxsomei* +/- *Callitris glaucophylla* +/- *Eucalyptus crebra* +/- *Angophora leiocarpa* woodland on Cainozoic sandplains/remnant surfaces |
| 11.7.1 | *Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana* or *E. microcarpa* woodland on lower scarp slopes on Cainozoic lateritic duricrust |
| 11.7.4, 11.7.4c | *Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* on Cainozoic lateritic duricrust |

| | |
|---|---|
| 11.7.6 | *Corymbia citriodora* or *Eucalyptus crebra* woodland on Cainozoic lateritic duricrust |
| 11.7.7 | *Eucalyptus fibrosa* subspp. *nubila* +/- *Corymbia* spp. +/- *Eucalyptus* spp. on Cainozoic lateritic duricrust |
| 11.8.3 | Semi-evergreen vine thicket on Cainozoic igneous rocks |
| 11.9.1 | *Acacia harpophylla-Eucalyptus cambageana* open-forest to woodland on fine-grained sedimentary rocks |
| 11.9.4, 11.9.4a, 11.9.4c | Semi-evergreen vine thicket on fine grained sedimentary rocks |
| 11.9.5 11.9.5a | *Acacia harpophylla* and/or *Casuarina cristata* open-forest on fine-grained sedimentary rocks |
| 11.9.7, 11.9.7a | *Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks |
| 11.9.10 | *Eucalyptus populnea*, *Acacia harpophylla* open-forest on fine-grained sedimentary rocks |
| 11.10.1, 11.10.1a 11.10.1d | *Corymbia citriodora* open-forest on coarse-grained sedimentary rocks |
| 11.10.3 | *Acacia catenulata* or *A. shirleyi* open-forest on coarse-grained sedimentary rocks. Crests and scarps |
| 11.10.7, 11.10.7a | *Eucalyptus crebra* woodland on coarse-grained sedimentary rocks |
| 11.10.9 | *Callitris glaucophylla* woodland on coarse-grained sedimentary rocks |
| 11.10.11, 11.10.11a | *Eucalyptus populnea*, *E. melanophloia* +/- *Callitris glaucophylla* woodland on coarse-grained sedimentary rocks |

## General Threats

Due to the lack of data available, assessment of threats is difficult.

Broad-scale vegetation clearing is likely to be a key threat in many areas. This leads to habitat destruction and fragmentation. Prior to European settlement, mallee and woodland habitats were extensive across inland eastern Australia. Agriculture is the main cause of habitat fragmentation; this is a threat as trapping surveys show the species displays a preference for larger habitats.

Increased fire frequencies destroy understorey vegetation and this may be a key microhabitat feature for this species.

The South-eastern Long-eared Bat is believed to forage on low ground and shrubs (DoE 2011). High density grazing around such regions destroys shrubs and limits the regeneration of the habitat. Overgrazing by feral species such as the rabbit may also pose a threat to this bat.

The availability of suitable roosting habitats is essential for the presence of bat populations. The South-eastern Long-eared Bat is known to roost in deadwood or hollow trunks / branches from 25mm – 30mm in size and frequently under bark. Standard forestry practices remove such items from the environment and are hence considered a potential threat.

## Project Threats

Impacts to this species are projected to be quite low, since no broad scale clearing of remnant vegetation will occur in any areas. The species is also highly mobile across habitats, which should ensure that populations are not fragmented.

The only other impact may be due to the loss of large riverine, hollow-bearing trees; however, pre-clearance surveys will identify such trees and will be avoided wherever possible.

**Development**

- Loss of habitat during construction;
- Damage or disturbance to roosting habitat;
- Loss of mature hollow bearing trees;
- Increased competition for tree hollows by feral species and species which may benefit from the disturbance;
- Mortality during clearing activities; and
- Increased likelihood of fire.

**Operation**

- Disturbance to foraging by light pollution;
- Disturbance to roosting/breeding by noise pollution;
- Increased likelihood and intensity of fire.

**Decommissioning**

- Disturbance to foraging by light pollution, and
- Disturbance to roosting/breeding by noise pollution.

## Management Strategies

The primary management strategy is to focus on the identification, avoidance and protection of individuals, populations, habitat and roosting sites.

Various mitigation measures outlining how this will occur are detailed in the following section.

Should the species be identified, and impacts confirmed, the management strategies outlined in **Section 4.1** of this SSMP will be applied.

Offset sites will potentially be established for unavoidable significant residual impacts to EPBC listed fauna species habitat.

## Mitigation Measures

Mitigation measures to minimise Project impacts on South-eastern Long-eared Bat are:

- Following the desktop assessment, scouting surveys will be undertaken in order to identify if there is any suitable habitat (or micro-habitat) impacted by the proposed clearing activities. If there is potential for suitable habitat to be adversely impacted, targeted surveys will be undertaken in order to confirm the presence/absence of species.

  Where appropriate and practicable, and in accordance with the EPBC Survey guidelines for Australia's threatened bats (DEWHA 2010) targeted surveys for the South-eastern Long-eared Bat should be undertaken on warmer nights from October through to April. The following survey methods are recommended by the guidelines and will be implemented where appropriate and practicable:

  - Passive acoustic detection: Bat detectors can be used to identify areas used by long-

eared bats, even if they cannot be identified to species level. Acoustic detection can then be followed up with an appropriate level of trapping.

  - Trapping: Mistnets and harp traps should only be placed in woodland, mallee and forests where suitable flyways are identified given that the species forages below the tree canopy, often to ground level.

- As part of routine pre-start meetings, work crews will be briefed on any known and potential environmental constraints occurring in that work location, including any likely significant flora and fauna species, populations and TEC they may encounter;
- Wherever practicable signage should be erected to increase the general awareness amongst work crews of the presence of this species and particularly any roosts in the area;
- All clearing activities to be carried out in a sequential manner and in a way that directs escaping wildlife away from clearing and into adjacent native vegetation or natural areas;
- Prior to clearing, limits of clearing areas including "no go" zones delineating roost sites identified during pre-clearance surveys will be clearly marked out with appropriate flagging material and/or barricade webbing as determined by the site Environment Representative;
- Pre-clearance survey to be undertaken by suitably qualified, experienced and licensed fauna catchers prior to any clearing activities being undertaken. If roosting sites for the South-eastern Long-eared Bat are identified within the clearance area or within close proximity to it, these sites shall be clearly marked out as a 'no go' zone with appropriate flagging material and/or barricade webbing as determined by the site Environment Representative. An appropriate buffer zone as determined by the licensed fauna spotter catcher shall also be applied and marked out around the roost site. These areas shall be recorded by GPS and mapped in the Environmental Constraints Mapping as temporary 'no go' zones until management actions are finalised;
- Clearing activities shall carry on around the outside of any defined buffer zone until appropriate actions to manage the roost site have been determined in conjunction with the licensed fauna spotter catcher. A monitoring programme to determine potential construction impacts to the roost shall be implemented during the construction period as per the monitoring section of this SSMP;
- All possible measures shall be taken to avoid disturbing any roost site including the reduction of the clearance area or relocation of any associated site infrastructure. If any previously unidentified high value roost areas such as caves are discovered during a pre-clearance survey, construction activities shall cease at this location and alternative construction techniques that will not compromise the stability of sandstone ridges containing the caves/roosts shall be investigated;
- If it is determined that an active roost cannot be avoided actions will be put in place as identified in the Species Management Program. This will include ensuring a licensed and experienced fauna spotter catcher who is in possession of appropriate permits for fauna relocation is onsite during all clearing activities and that any injured bats are transported to an appropriate veterinarian or wildlife carer immediately;
- All recorded sightings of South-eastern Long-eared Bat, the locations of any breeding sites and any relocations which may be required will be reported to the relevant authority as part of the Project reporting;
- Dust suppression measures including road watering and reduced vehicle speeds will be implemented to minimise dust deposition in habitat areas;
- Where possible, when erecting any project related fencing the use of barb wire, particularly on the top strand, is to be avoided to avoid birds and other fauna getting caught;
- Where barbed wire fencing is absolutely necessary, QGC will investigate the use of the following design:
  - electrical fence ribbon should be co-located with the top strand of barbed wire, or
  - plastic bunting (or warning tags) should be attached to the top strand of barbed wire.

- Where the species has been identified in proximity to the Gas Field infrastructure, temporary lighting shall be directed away from light-sensitive areas such as nesting areas and light shades and low lighting must be applied to construction and operational areas where these are located adjacent to remnant vegetation and other environmentally sensitive areas, where practicable;
- Vehicle activities should be restricted to roads, access tracks and hardened surfaces to reduce potential impacts to threatened species;
- Fire management measures shall take into account the need to protect remnant vegetation from frequent and hot fires. On site fire management practices shall be in accordance with relevant construction permits and method statements and appropriate dedicated fire fighting equipment will be available at high risk construction sites to manage any fires that may start up and to avoid wildfires breaking out; and
- Should non-compliance with the mitigation measures or management strategies outlined in this SSMP occur on site an investigation shall be undertaken by all responsible parties followed by corrective action procedures if required. Work in the area will cease at the time of the non compliance if the incident is deemed significant by the site Environment Representative.

## Rehabilitation and Recovery

Rehabilitation will be progressively undertaken during construction following backfilling and completion of infrastructure establishment. Natural regeneration of disturbed areas will be encouraged after construction activities and also at the conclusion of the Project.

## Performance Measures

Pre-clearance surveys are undertaken of each planned infrastructure area (also known as a pegging party) by a qualified ecologist to identify the presence / absence of the South-eastern Long-eared Bat or their roost sites.

Avoidance of roost sites where possible.

Successful establishment of artificial roost sites where appropriate.

## Monitoring

If a South-eastern Long-eared Bat roost is identified and located within or in close proximity to the clearance area, a monitoring programme to capture any potential disturbance impacts arising from construction activities will be developed in accordance with the Survey Guidelines for Australia's threatened Bats. The monitoring programme shall continue for the duration during which any construction related activities are being carried out which may have a potential impact on the roost site.

## References

Atlas of Living Australia (2013), Available from http://bie.ala.org.au/species/Nyctophilus+corbeni , Accessed 3 December 2013.

Department of Environment and Heritage Protection (DEHP) (2013) *Wildlife Online Extract. The Department of Environment and Heritage Protection,* Brisbane. Available: http://www.ehp.qld.gov.au/wildlife/wildlife-online/index.html, Accessed December 2013.

Department of Environment, Heritage, Water and the Arts (DEWHA) (2010). *Survey guidelines for Australia's threatened bats*, Commonwealth of Australia, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (2011). Nyctophilus corbeni in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed Thu, 3 Feb 2011.

Dominelli, S. (2000). *Distribution, roost requirements and foraging behaviour of the Greater Long-eared Bat (Nyctophilus timoriensis) and the Little Pied Bat (Chalinolobus picatus) in the Bookmark Biosphere Reserve. Unpublished report*. Unpublished report to the *Bookmark Biosphere Trust*, South Australia.

Duncan, A, Baker, G.B. and Montgomery, N. (1999). *The Action Plan for Australian Bats*. Environment Australia.

Ellis, M., Lumsden, L. Schulz, M. Reardon, T. Richards G. and Hoye, G. (1999). Eastern Long-eared Bat. Pp. 42-43. **In:** Duncan, A., G.B. Baker, and N. Montgomery. (Eds.). *The Action Plan for Australian Bats*. Canberra: Environment Australia.

Koehler, S. (2006). New record of a Greater Long-eared Bat in Victoria. *Australasian Bat Society Newsletter* 26: 43-44.

Law, B. and Anderson, J. (1999). A survey for the Southern *Myotis Myotis macropus* (Vespertilionidae) *and other bat species in River Red Gum Eucalyptus camaldulensis forests of the Murray River, New South Wales. Australian Zoologist 31*:166-174.

Lumsden, L.F. (1994). The distribution, habitat and conservation status of the Greater Long-eared Bat *Nyctophilus timoriensis* in Victoria. *Victorian Naturalist* 111: 4-9.

Lumsden, L. and Bennett A. (2000). *Bats in rural landscapes: a significant but largely unknown faunal component.* T. Barlow and R. Thorburn, eds. *Bushcare Grassy Landscapes Conference*. Page(s) 42-50. Canberra: Environment Australia, Biodiversity Group.

McFarland, D., Venz, M. and Reis, T. (1999). *Priority Species Summaries. An attachment to the report: Terrestrial Vertebrate Fauna of the Brigalow Belt South Bioregion: Assessment and Analysis for Conservation Planning*. Brisbane: Biodiversity Planning, Environmental Protection Agency.

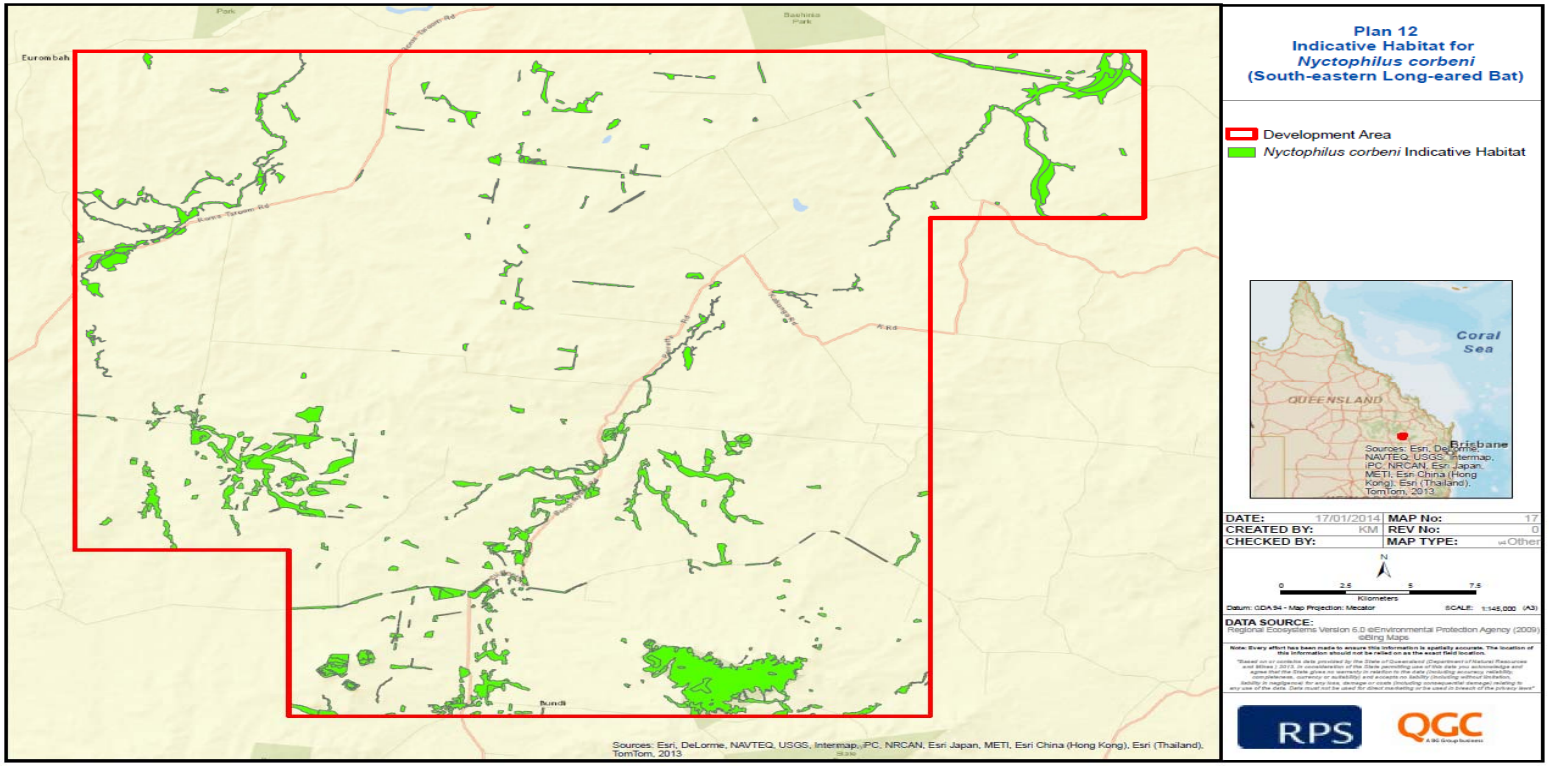
Parnaby, H. (1995). *Greater Long-eared Bat Nyctophilus timoriensis*. Chatswood, NSW: Reed Books.

Schulz, M. and Lumsden, L. (2010). *(Draft) National Recovery Plan for the South-eastern Long-eared Bat* Nyctophilus corbeni. Victorian Department of Sustainability and Environment.

Turbill, C. and Ellis, M. (2006). *Distribution and abundance of the south eastern form of the Greater Long-eared Bat Nyctophilus timoriensis*. *Australian Mammalogy* 28:1-7.

Van Dyck, S. and Strahan, R. (2008). *The Mammals of Australia, Third Edition*. Page(s) 880. Sydney: Reed New Holland.

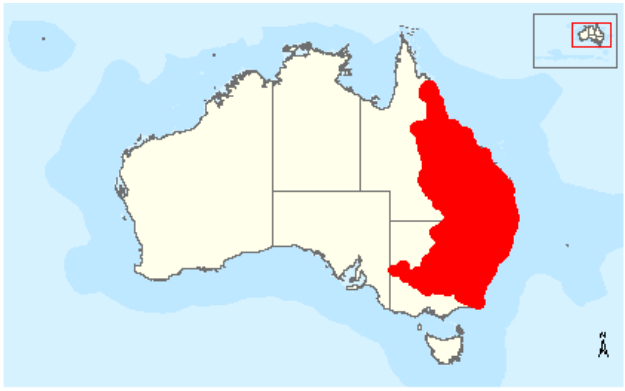
## Plan 12: South-eastern Long-eared Bat Indicative Habitat map



### 4.7.4.2 Phascolarctos cinereus (Koala)

**Significant Species Management Plan 13**
***Phascolarctos cinereus* (Koala)**


*Phascolarctos cinereus* (Photo: Gerry Pearce)



*Phascolarctos cinereus* distribution (DoE, 2012a)

**EPBC Act Conservation Status**

Vulnerable

**NC Act Conservation Status**

Area other than South East Queensland Bioregion – Special Least Concern Animal

South East Queensland – Vulnerable

**Known Distribution**

Koalas occur throughout Eastern Australia in Queensland, New South Wales, Victoria and South Australia. In Queensland the highest concentrations are in South East Queensland, particularly within the local government areas of Sunshine Coast, Moreton Bay, Brisbane, Ipswich, Logan, Redland and Gold Coast. Lower densities occur throughout the rest of the state.

**Occurrence within Development Area**

The Koala is known to occur within the Brigalow Belt Bioregion. The Brigalow Belt Bioregion tends to support lower density populations compared to the coastal regions of the Southeast Queensland Bioregion. The species is likely to be scattered throughout the Brigalow Belt Bioregion and may occur in a range of ecosystems. In particular, Koalas are more likely to inhabit fringing riparian regional ecosystems associated with watercourses and low ranges particularly dominated by *Eucalyptus tereticornis* (Forest Blue Gum), *E.camaldulensis* (River Red Gum), *E. biturbinata* (Grey Gum), *E. populnea* (Poplar Box), *and E.thozetiana* (Napunyah) where water availability tends to be higher.

Koala can be present in a number of regional ecosystems which contains Eucalyptus species. However, DEHP (2012a) considered that critical habitat required for the survival of the Koala includes any form of landscape corridor which is essential to the dispersal of Koalas between forest or woodland habitats (including patches cleared of vegetation). Koala will be mostly associated with the following Regional Ecosystems in the Gas Fields: RE11.3.2, 11.3.4, 11.3.6, 11.3.9, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.3.37, 11.3.38, 11.4.2, 11.4.8, 11.4.9b, 11.4.10, 11.4.12, 11.5.1, 11.5.2, 11.5.4, 11.5.5, 11.5.9, 11.5.13, 11.5.20, 11.9.1, 11.9.2, 11.9.13 and 11.10.1.

Indicative habitat has been mapped for this species using RE associations, as presented in **Plan 13**.

**Regional Ecosystem Short Description**

| | |
|---|---|
| 11.3.2 | *Eucalyptus populnea* (Poplar Box) woodland on alluvial plains. |

| | |
|---|---|
| 11.3.4 | *Eucalyptus tereticornis* (Forest Blue Gum) and/or *Eucalyptus spp*. tall woodland on alluvial plains. |
| 11.3.6 | *Eucalyptus melanophloia* (Silver-leaved Ironbark) woodland on alluvial plains. |
| 11.3.9 | *Eucalyptus platyphylla* (White Gum), *Corymbia spp* (Bloodwoods). woodland on alluvial plains. |
| 11.3.14 | *Eucalyptus spp., Angophora spp., Callitris spp*. woodland on alluvial plains. Sandy soils. |
| 11.3.17 | *Eucalyptus populnea* (Poplar Box) woodland with *Acacia harpophylla* (Brigalow) and/or *Casuarina cristata* (Belah) on alluvial plains. |
| 11.3.18 | *Eucalyptus populnea, Callitris glaucophylla (Cypress), Allocasuarina luehmannii* (Bull-oak) shrubby woodland on alluvium. |
| 11.3.25 | *Eucalyptus tereticornis* (Forest Blue Gum) or *E. camaldulensis* (River Red Gum) woodland fringing drainage lines. |
| 11.3.37 | *Eucalyptus coolabah* (River Coolabah) fringing woodland on alluvial plains. |
| 11.3.38 | *Eucalyptus tereticornis (Forest Blue Gum), Melaleuca viridiflora* (Tea Tree), *Corymbia tessellaris* (Moreton Bay Ash) and *Eucalyptus fibrosa subsp (Broad-leaf Ironbark)*. (Glen Geddes) woodland with a grassy ground layer. Occurs on alluvial plains and broad drainage lines derived from serpentinite. |
| 11.4.2 | *Eucalyptus spp*. and/or *Corymbia spp*. grassy or shrubby woodland on Cainozoic clay plains. |
| 11.4.8 | *Eucalyptus cambageana* (Dawson Gum) woodland to open forest with *Acacia harpophylla* (Brigalow) or *A. argyrodendron* on Cainozoic clay plains. |
| 11.4.9b | *Acacia harpophylla* (Brigalow), *Eucalyptus thozetiana* (Yapunyah) and/or *E. cambageana* (Dawson Gum) shrubby open forest to woodland with *Terminalia oblongata* (Yellow-wood) on Cainozoic clay plains. |
| 11.4.10 | *Eucalyptus populnea* (Poplar Box) or *E. pilligaensis* (Gum-topped Box), *Acacia harpophylla* (Brigalow), *Casuarina cristata* (Belah) open forest to woodland on margins of Cainozoic clay plains. |
| 11.4.12 | *Eucalyptus populnea* (Poplar Box) woodland on Cainozoic clay plains. |
| 11.5.1 | *Eucalyptus crebra, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces. |
| 11.5.2 | *Eucalyptus crebra* (Narrow-leaf Ironbark), *Corymbia spp*. (Bloodwoods), with *E. moluccana* (Grey Box) on lower slopes of Cainozoic sand plains/remnant surfaces. |
| 11.5.4 | *Eucalyptus crebra, Callitris glaucophylla, C. endlicheri, E. chloroclada, Angophora leiocarpa* on Cainozoic sand plains/remnant surfaces. Deep sands. |
| 11.5.5 | *Eucalyptus melanophloia, Callitris glaucophylla* woodland on Cainozoic sand plains/remnant surfaces. Deep red sands. |
| 11.5.9 | *Eucalyptus crebra* (Narrow-leaf Ironbark) and other *Eucalyptus spp*. and *Corymbia spp*. woodland on Cainozoic sand plains/remnant surfaces. Plateaus and broad crests. |
| 11.5.13 | *Eucalyptus populnea* (Poplar Box) +/- *Acacia aneura* (Mulga) +/- *E. melanophloia* (Silver-leaf Ironbark) woodland on Cainozoic sand plains/remnant surfaces. |

| | |
|---|---|
| 11.5.20 | *Eucalyptus moluccana* (Grey Box) and/or *E. microcarpa* (Inland Grey Box) / *E. pilligaensis* (Gum Top Box) +/- *E. crebra* (Narrow-leaf Ironbark) woodland on Cainozoic sand plains. |
| 11.9.1 | *Acacia harpophylla* (Brigalow) / *Eucalyptus cambageana* (Dawson Gum) open forest to woodland on fine-grained sedimentary rocks. |
| 11.9.2 | *Eucalyptus melanophloia* (Silver-leaf Ironbark) +/- *E. orgadophila* (Coolabah) woodland on fine-grained sedimentary rocks. |
| 11.9.13 | *Eucalyptus moluccana* (Grey Box) or *E. macrocarpa (Inland Grey Box)* open forest on fine grained sedimentary rocks. |
| 11.10.1 | *Corymbia citriodora* (Spotted Gum) open forest on coarse-grained sedimentary rocks |

**Description and Relevant Characteristics**

The Koala is of medium size with predominately grey coloured fur. It has large round ears, a stocky body, a very small tail and sharp claws. It is a marsupial with a backward facing pouch. While there is only one species of Koala, their appearance differs throughout their range and these adaptations are thought to be linked to regional characteristics, such as temperature. Generally, populations in the northern parts of the range are smaller and have lighter coloured fur than populations further south (DoE, 2012b).

**Biology and Reproduction**

The Koala is a leaf-eating, tree-dwelling marsupial that feeds predominantly on *Eucalyptus* species. Other tree species that may form part of the Koala's diet includes species of Lophostemon, *Corymbia* and *Melaleuca* genera. They are considered to be selective feeders as they may only feed on a small selection of tree species in their range and prefer young foliage at the ends of branches.

On average, Queensland Koalas weigh between 5 and 10 Kilograms, with males being larger than females. They have a lifespan of about 15 years in the wild. Koalas are solitary animals with their own home range, which is usually arranged in an overlapping matrix with those of other Koalas. The size of a home range may differ greatly depending on the quality of habitat, food sources available and the gender of the Koala (males generally have larger home ranges) (DoE, 2012b).

Females breed from two years of age and give birth once per year, usually in January or December (although it may be earlier or later). Young emerge from the pouch at six months of age and are weaned at about twelve months.

Chlamydial infections of the reproductive tract may cause infertility in female Koalas, affecting the reproductive potential of a population and stunting population growth. It is thought that the occurrence of these infections may increase due to environmental stresses (DEHP, 2008).

Weaned Koalas often have a home range overlapping with their mothers until approximately two to four years of age at which point they disperse. This puts them at greater risk of vehicle strikes and dog attacks (DEHP, 2006).

**Preferred habitat and Microhabitat**

Koalas live in ecosystems where the vegetation is dominated by eucalypt species, including a range of temperate, sub-tropical and tropical forests, woodlands and semi-arid communities. While the Koala may occur in a variety of habitats its presence is dependent on the availability of food trees and may also be influenced by altitude, temperature, soil fertility, leaf moisture and water availability. Within the Brigalow Belt Bioregion, Koalas are more likely to inhabit fringing riparian regional ecosystems associated with watercourses and low ranges particularly dominated by *Eucalyptus tereticornis* (Forest Blue Gum), *E. camaldulensis* (River Red Gum), *E. biturbinata* (Grey Gum), *E.populnea* (Poplar Box), and *E.thozetiana* (Napunyah) (DEHP, 2008).

**General Threats**

The main threats to the Koala are the loss of habitat and fragmentation due to land development, death or injury from vehicle collision, attach by dogs and disease (DoE, 2013). Land clearance reduces the amount of suitable habitat available to the Koala which can force Koalas moving across the landscape into an area already occupied by a Koala population.

Other threats include:

- Direct fatality due to clearing activities and proximity to heavy machinery;
- Degradation of habitat from disturbance of feed trees;
- Reduced water availability;
- Dust (from traffic movement or project activities) has the potential to affect this species during construction periods and long periods without rain. This can lead to habitat degradation and respiratory issues;
- The level of vibration resulting from the proposed activities is found to be negligible for this species;
- Altered Fire Regimes;
- Loss and fragmentation of habitat;
- Death or injury from vehicle strikes;
- Disease;
- Predation by dogs; and,
- Drought, extreme heat and fires

## Project Threats

### Development Threats

- Loss and fragmentation of habitat from clearing activities;
- Increased vehicles strikes due to increased road traffic; and
- Direct fatality due to clearing activities and proximity to heavy machinery.

### Operational Threats

- Vehicle strikes due to continued road use for project activities;
- Degradation of habitat by weed invasion from disturbed areas; and
- Altered Fire Regimes.

### Decommissioning Threats

- Vehicle strikes due to continued road use for project activities;
- Degradation of habitat by weed invasion from disturbed areas; and
- Altered Fire Regimes.

## Management Strategies

The primary management strategy is to focus on the identification and avoidance of individuals, habitat and breeding areas and to avoid injury or death in gathering, access and trunkline trenches.

Various mitigation measures outlining how this will occur are detailed in the following section.

Should the Koala or its habitat be identified, and impacts confirmed, the management strategies outlined in **Section 4.1** of this SSMP will be applied.

## Mitigation Measures

Mitigation measures to minimise Project impacts on Koalas are:

- Following a desktop assessment, environmental surveys will be undertaken in order to identify if any suitable Koala habitat (Including Microhabitat) will be impacted by the proposed clearing activities. If there is a potential for suitable habitat to be adversely impacted, targeted surveys will be undertaken in order to confirm the presence/absence of the species and to assess the extent and condition of suitable habitat, including food trees.

- The Department of Environment (DoE, 2012b) recommends the following Survey methods for Koalas. These survey methodologies maybe implemented where appropriate and practicable.
    - Spot Assessment Technique (SAT) developed by Phillips, S. & Callaghan, J. (2011), to identify the relative importance of the habitat;
    - Koala survey of the entire area for presence of Koalas, for areas less than 50 ha;
    - Koala survey using a Sampling Strategy for areas greater than 50 ha;
    - Habitat assessment including the canopy tree species composition, percentage of canopy cover of each species, vegetative ground cover, leaf litter cover, bare ground, area of surface water, distance to surface water, evidence of dogs in the area
- If Koalas are known to be present in the area, consideration must be given in the pegging of infrastructure, which includes:
    - Actual and potential clearing of Koala habitat must be avoided wherever possible;
    - If unavoidable, areas of lower habitat value or pre-existing disturbance must be preferentially chosen for infrastructure;
    - Areas with higher incidences of preferred food trees must be avoided; and
    - Fragmentation of habitat by linear infrastructure, such as roads, tracks and pipes, must be avoided by altering alignments to divert around Koala habitat, wherever possible and practicable.
- Pre-clearance survey to be undertaken by suitably qualified, experienced and licensed fauna catchers prior to any clearing activities being undertaken. Fauna spotter must also be present during vegetation clearing activity at all time.
- Prior to clearing, limits of clearing delineating actual Koala habitat identified during pre-clearance surveys will be clearly marked out with appropriate flagging material and/or barricade webbing as determined by the site Environment Representative.
- Clearing is to be carried out in a sequential manner and in a way that directs escaping wildlife away from clearing and into adjacent native vegetation or natural areas of their own volition. Sequential clearing coupled with the slow nature of the clearing activities will take into account any variation in landscape features such as rocky escarpments, riparian habitats and steep sloping areas and provide fauna with sufficient time to exit the disturbance area. Decisions will then be made jointly between the spotter catchers and construction contractor as to the most appropriate clearing method based on each situation and the surrounding landscape/geological features;
- All clearing activities will be carried out in a manner that will avoid the isolation of habitat, habitat features or any noted fauna persisting within the construction areas.
- If a Koala is found prior to or during clearing activities, it must not be forcibly relocated. Any tree that has a Koala present, as well as any tree with its crown overlapping that tree, must not be removed and remain in place until the Koala vacates the tree of its own accord.
- Allow a buffer zone distance equal to the height of the tree or surrounding trees (whichever is tallest) or a buffer zone deemed appropriate by the spotter catcher.
- Clearly mark out this area to ensure contractors and personnel do not clear the trees until vacation by the Koala is confirmed.
- As part of routine pre-start meetings, work crews will be briefed on any known and potential environmental constraints occurring in that work location, including any likely significant flora and fauna species, populations and TEC they may encounter.
- Wherever practicable, signage should be erected to increase the general awareness amongst

work crews of the presence of the species.

- Any injured fauna shall be transported to a veterinarian or recognised wildlife carer immediately for treatment.
- To avoid and minimise injury to Koalas in gathering line and trunkline trenches, in areas where threatened fauna species susceptible to be caught in trenches are likely to occur, fauna spotter catchers must inspect and remove any fauna from gathering line and trunkline trenches twice daily (early morning and late afternoon) every day while the trenches are open and have access to the site in all weather. In all other areas fauna spotter catchers shall inspect trenches at least once daily.
- Prior to backfilling of the trench site personnel will check the open trench for trapped fauna and where required a fauna spotter catcher will be called to move any fauna to a safe location away from the trench.
- All recorded sightings of Koalas will be reported as part of the Project reporting.
- Dust suppression measures including road watering and reduced vehicle speeds will be implemented to minimise dust deposition in habitat areas;
- In areas where mulching of cleared vegetation for distribution during rehabilitation may not be undertaken; vegetation shall be stick raked into piles to provide fauna habitat;
- Vehicle activities should, where practicable, be restricted to roads, access tracks and hardened surfaces to reduce potential impacts to threatened species;
- Fire management measures shall take into account the need to manage remnant vegetation from frequent and hot fires. On site fire management practices shall be in accordance with Contractor;
- Relevant construction permits and method statements and appropriate dedicated fire fighting equipment will be available at high risk construction sites to manage any fires that may start up and to avoid wildfires breaking out. And,
- Should non-compliance with the mitigation measures or management strategies outlined in this SSMP occur on site, an investigation shall be undertaken by all responsible parties followed by corrective action procedures if required. Work in the area will cease at the time of the non-compliance if the incident is deemed significant by the site Environment Representative.

**Rehabilitation and Recovery**

Rehabilitation will be progressively undertaken during construction following backfilling and completion of infrastructure establishment. Natural regeneration of disturbed areas will be encouraged after construction activities and also at the conclusion of the project.

**Performance Measures**

Pre-clearance surveys are undertaken of each planned infrastructure area (also known as a pegging party) by a qualified ecologist to identify any potential or actual impacts on Koala populations and/or their habitat. Presence / absence surveys for this species should be carried out in accordance with the DoE Survey guidelines.

**Monitoring**

- In areas where the Koala is likely to be present, fauna spotter catchers must monitor gathering line and trunkline trenches twice daily (early morning and late afternoon) every day while the trenches are open and have access to the site in all weather. In all other areas fauna spotter catchers shall monitor trenches at least once daily.
- Activities within the 'No-Go' Zone(s) limited to ecological survey/mitigation work. All other activities require approval from the QGC Management Team.

- Effectiveness of 'No-Go' Zone management to be recorded during the weekly inspections and reported in the weekly site environmental inspection checklist.
- If works are to occur within close proximity to a nest area, work must be undertaken in accordance with the SSMP especially the following information:
  - Any incidents involving the Koala will be reported to DEHP within 24 hours followed by a written incident report within 10 business days of initial notification;
  - The person in charge (e.g. Field Environmental Officer) will be notified immediately of the occurrence of an incident involving the Koala; and,
  - All incident, non-compliances of approval conditions, species record, checklist, and any reports must be recorded as per described in the in this SSMP and according to approval requirements. The report must include actions taken to bring the matter into compliance.

**References**

Department of Environment and Heritage Protection (2006), *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016*. Available at <www.ehp.qld.gov.au/wildlife/Koalas/ legislation/pdf/conservation-plan-06-16.pdf> (Accessed 21 September 2012).

Department of Environment and Heritage Protection (2008), *Conservation management Profile Koala Phascolarctos cinereus*. Available at < www.ehp.qld.gov.au/register/p02352aa.pdf> (Accessed 11 December 2012).

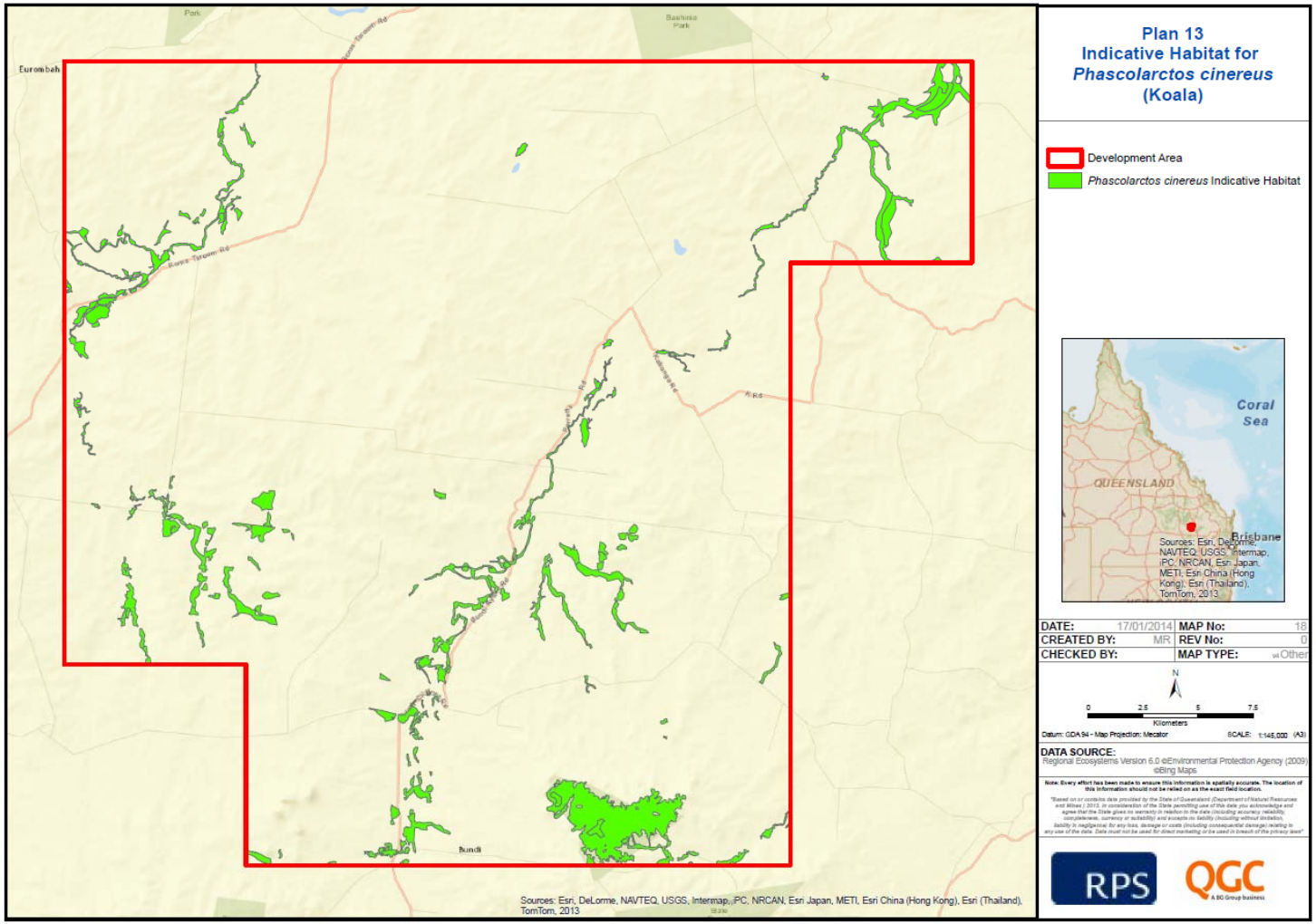
Department of Environment (2012a), *Koala species listing factsheet*. Available at <http://www.environment.gov.au/biodiversity/threatened /publications/pubs/bio220-0412-Koala-lisiting-factsheet-general.pdf> (Accessed 11 December 2012).

Department of Environment (2012b), *Interim Koala referral advice for proponents*. Available at < www.environment.gov.au/epbc/publications/ pubs/bio240-0612-interim-Koala-referral-advice.pdf> (Accessed 30 July 2012).

Department of Environment (2013), *Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) in Species Profile and Threats Database,* Department of Environment, Canberra. Available at < www.environment.gov.au/sprat> (Accessed 10 Jan 2013).

Phillips, S. & Callaghan, J. (2011), *The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas Phascolarctos cinereus*, *Australian Zoologist*, (online) Available at < www.biolink.com.au/sites/www.biolink.com.au/files/publications/Phillips%20%26%20Callaghan> (pdf) (Accessed 09 January 2013).

## Plan 13: Koala Indicative Habitat map




Plan 13 – *Phascolarctos cinereus*