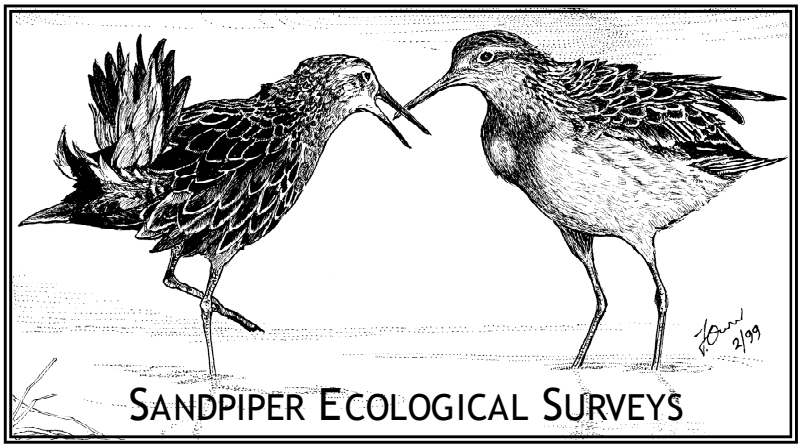
# BRITISH GAS LIQUID NATURAL GAS PROJECT, CURTIS ISLAND

## ~ TARGETED BIRD SURVEY ~

## 28 NOVEMBER 2008



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## 28 NOVEMBER 2008

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# 1. INTRODUCTION

## 1.1 Background

Sandpiper Ecological Surveys and Wildsearch Environmental Services were contracted by ERM to conduct a comprehensive bird survey of the proposed British Gas Liquid Natural Gas facility at Curtis Island, Queensland. The objectives of the survey were to:

- Determine the species richness of birds within the subject site and assess the type and quality of bird habitat.
- Determine if the site is utilised or contains suitable habitat for threatened birds listed on the Queensland *Nature Conservation (NC) Act 1992* and/or the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.
- Provide advice on the impact of the proposal on birds.
- Provide recommendations to mitigate impacts on birds.

## 1.2 Subject Site and Study Area

The subject site includes the terrestrial and immediately adjacent intertidal habitat within the boundary of the proposed LNG facility (Figure 1). The study area includes all habitats within 500m of the subject site. Whilst most survey effort was concentrated in the subject site sampling within the broader study area was undertaken to ensure comprehensive survey coverage.

# 2. METHODS

## 2.1 Collation of background data

A search of the Queensland Department of Environment and Heritage web-based wildlife record database (www.deh.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl) was undertaken to obtain records of fauna species, particularly avifauna, occurring at the subject site and in the surrounding region. A search of the Queensland Environment Protection Agencies regional ecosystems database (www.epa.qld.au/projects/redd) was also undertaken. The Schedules of threatened fauna listed under the Queensland *Nature Conservation (NC) Act 1992* and the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* were searched to identify threatened species that may occur within the subject site. These species were subsequently targeted during the field survey.

## 2.2 Site Perusal and Survey Design

Prior to the commencement of the field survey aerial photographs and Regional Ecosystem mapping was perused to identify major fauna habitats. A foot-based traverse of the subject site was conducted on 29 September 2008 to further verify the type and distribution of bird habitat. Sample sites were allocated to each Regional Ecosystem and habitat type. Where possible, sample sites within a habitat or ecosystem were a minimum of 500m apart. In some cases sample sites were closer, although this does not affect the results due to the qualitative nature of the survey. Field surveys were conducted over nine days, from 29 September to 3 October and 6 to 9 October 2008.

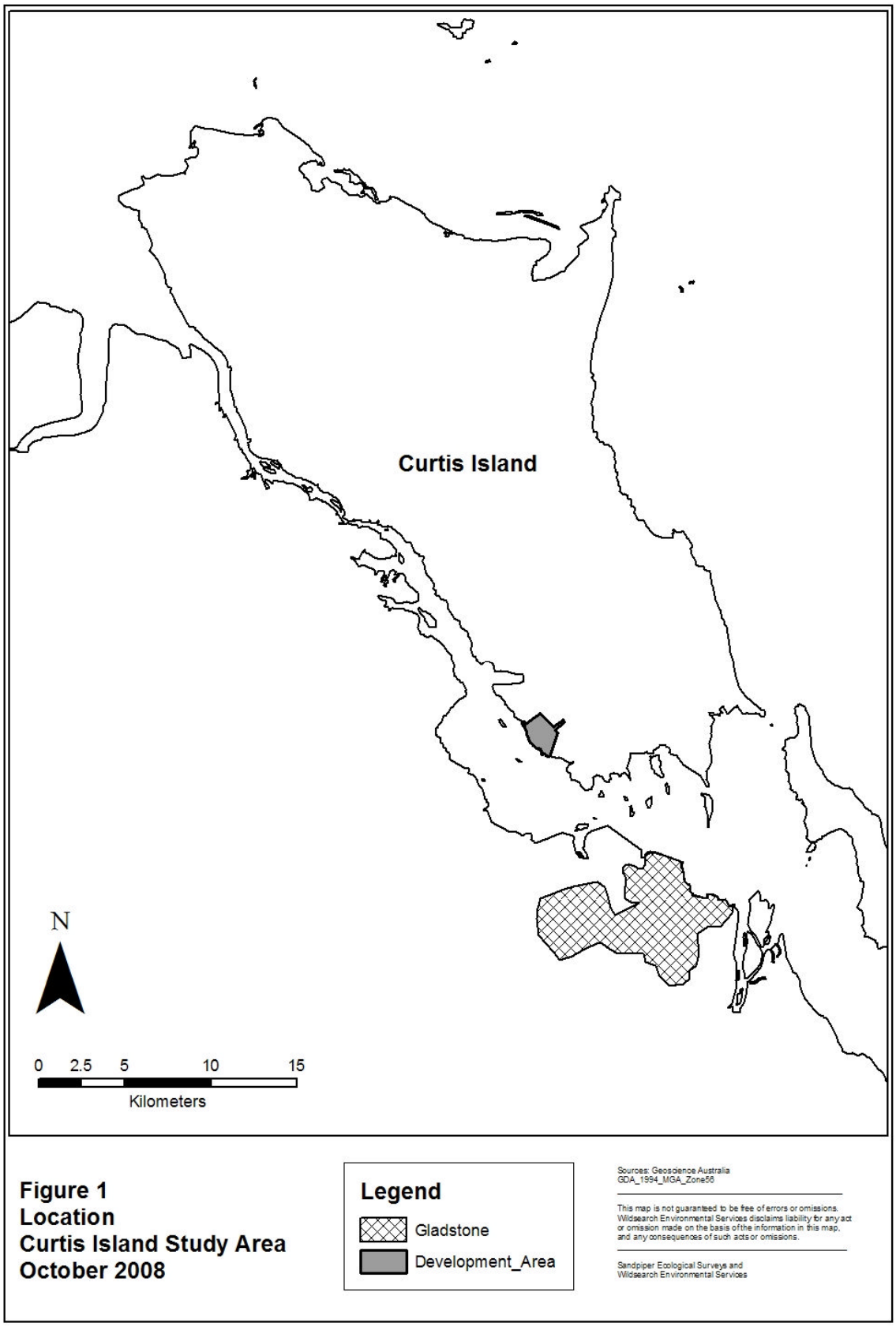


**Figure 1**
**Location**
**Curtis Island Study Area**
**October 2008**

## 2.3 Bird Surveys

### 2.3.1 Area Searches

Thirty 2ha sample plots were established throughout the subject site with replicate plots situated in each of the major vegetated habitats (Figure 3). Each plot was sampled on two occasions with 20 minutes spent recording bird species during each survey. All area-searches were conducted between 0600hrs and 0930hrs. Data were recorded on a standard bird survey proforma.

### 2.3.2 High and Low Tide Surveys

Intertidal habitat was sampled during high and low tide to assess use of the site by estuarine birds, particularly shorebirds (Order Charadriiformes). High tide surveys were conducted on two occasions, one spring tide (1.10.08) and one neap tide (6.10.08). One low tide survey was conducted during a neap tide cycle (7.10.08). The time of high and low tide was determined through visual observation of water level on-site and with reference to National Tidal Centre tide predictions and local tide variations.

At high tide two transects were established parallel to and on the landward side of the mangrove fringe (Figure 4). Each transect was traversed by two observers and all species were identified and the number of individuals counted. Care was taken to avoid double counting and if birds were flushed during the survey their direction of flight was noted. To place the subject site in a local context known high tide roosts in the vicinity of South End were sampled on 3 October 2008.

At low tide the subject site was divided into two areas and each area was traversed on foot by two observers (Figure 4). The number of species and individuals on each intertidal area was recorded. Most of the intertidal habitat adjoining the subject site was sampled apart from a small section in the middle of the site.

### 2.3.3 Call Broadcast

Call broadcast (or playback) was used during three time periods to target different species. Selective call broadcast was undertaken during the day to illicit a response from species that were expected to be common in the subject site, namely Shining Flycatcher (*Myiagra alecto*) and Mangrove Honeyeater (*Lichenostomus fasciogularis*). Dusk call broadcast was conducted for Black Bittern (*Ixobrychus flavicollis*) on two nights at three sites along the mangrove fringe.

Nocturnal call broadcast was conducted on three nights between 1830 and 2100hrs at three sites (Figure 3A). The early evening time period was selected to maximize the opportunity of detecting owls that were roosting on or in close proximity of the site. At night calls of three species, Barn Owl (*Tyto alba*), Masked Owl (*Tyto novaehollandiae*) and Powerful Owl (*Ninox strenua*) were broadcast. Both Masked and Barn Owls were targeted at playback sites 1 and 3 with Powerful Owl targeted at site 2. Calls were broadcast for five minutes with a 3-5 minute gap between calls. Ten minutes was spent listening for calls prior to and after broadcast and a brief spotlight survey of the playback site was conducted at the completion of the final 10 minute listening period. Nocturnal call broadcast was conducted by two personnel.

### 2.3.4 Dusk Census

Dusk surveys were conducted at four sites with Site 3 sampled on three occasions (Figure 3A). Surveys were conducted by two observers for between 30 and 60 minutes with all surveys undertaken between 1700 and 1845hrs. During the census all species and, if possible, the number of individuals calling or sighted were recorded.

### 2.3.5 Fauna Features Traverse

The subject site and study area were traversed on foot during each day of the survey. Surveys were undertaken by two staff each conducting a random meander traverse to search for specific fauna features, such as roost or nest trees, raptor nests, button-quail feeding sites, additional bird habitats and additional bird species.

### 2.3.6 Waterhole Surveys

Due to the absence of freshwater on the subject site observations were conducted at two nearby waterholes (Figure 3A). One waterhole was sampled on two occasions and the other on one occasion. This method was aimed at identifying additional species that may utilise the subject site but were absent during the survey due to the lack of freshwater. Each waterhole survey extended for 60 minutes and surveys were conducted during the mid morning, midday and late afternoon.

### 2.3.7 Shoreline (Chat) Survey

Shoreline surveys were conducted on two occasions (6 October 2008 and 9 October 2008). Saltmarsh and other shoreline habitats that had some potential to support shoreline-dependant bird species were quietly traversed on foot by two staff (Figure 4). During each traverse the shoreline was scanned using binoculars for any fauna. The Yellow Chat (*Ethianura crocea macgregori*) was targeted by sampling these saltmarsh and other wetland habitats.

### 2.3.8 Habitat Assessment

Habitat was assessed within a 25m by 25m quadrant within a majority of the 2ha (Area Search) plots. A standard habitat assessment proforma was used to collect information on fauna habitat features, including, Disturbance History, Vegetation Structure and Floristics, Density of Arboreal Hollows, Foraging Resources and Ground Layer Attributes.

### 2.3.9 Targeted surveys for threatened species

Bird species listed on the Queensland *Nature Conservation (NC) Act 1992* and/or the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* were targeted. These species included: Red Goshawk (*Erythrotriorchis radiatus*) (Endangered), Yellow Chat *Ethianura crocea macgregori*) (Endangered), Beach Stone-curlew (*Esacus magnirostris)* (Vulnerable), Black-breasted Button-quail (*Turnix melanogaster*) (Vulnerable), Black-throated Finch (*Poephila cincta cincta*) (Vulnerable), Powerful Owl (*Ninox strenua*) (Vulnerable), Squatter Pigeon (*Geophaps scripta scripta*) (Vulnerable), Grey Goshawk (*Accipter novaehollandiae*) (Rare), Square-tailed Kite (*Lophoictinia isura*) (Rare), Painted Honeyeater (*Grantiella picta*) (Rare), Black-chinned Honeyeater (*Melithreptus gularis*) (Rare), Turquoise Parrot (*Neophema pulchella*) (Rare), Eastern Curlew (*Numenius madagascariensis*) (Rare) and Lewin's Rail (*Rallus pectoralis*) (Rare).

A summary of the survey effort is provided in Table 1 and the techniques used to target threatened species are summarised in Table 2.

## 2.4 Butterflies

Butterflies were recorded opportunistically whilst conducting other activities. Particular attention was focused on recording butterflies around flowers in mangrove and woodland habitat in the early and mid-morning whilst conducting morning bird surveys and habitat assessments.


**Figure 2:**
**Regional Ecosystems**
**October 2008**

**Legend**

calliope_re03

Development_Area

Sources:
Dept of Natural Resources and Water.
Aerial Photo - 18.07.2007

GDA_1994_MGA_Zone56

This map is not guaranteed to be free of errors or omissions. Wildsearch Environmental Services and Sandpiper Ecological Surveys disclaims liability for any act or omission made on the basis of the information in this map, and any consequences of such acts or omissions.

Sandpiper Ecological Surveys and Wildsearch Environmental Services. October 2008


**Figure 3**
**Curtis Island Bird Survey**
**2ha Plot Locations:**
**October 2008**

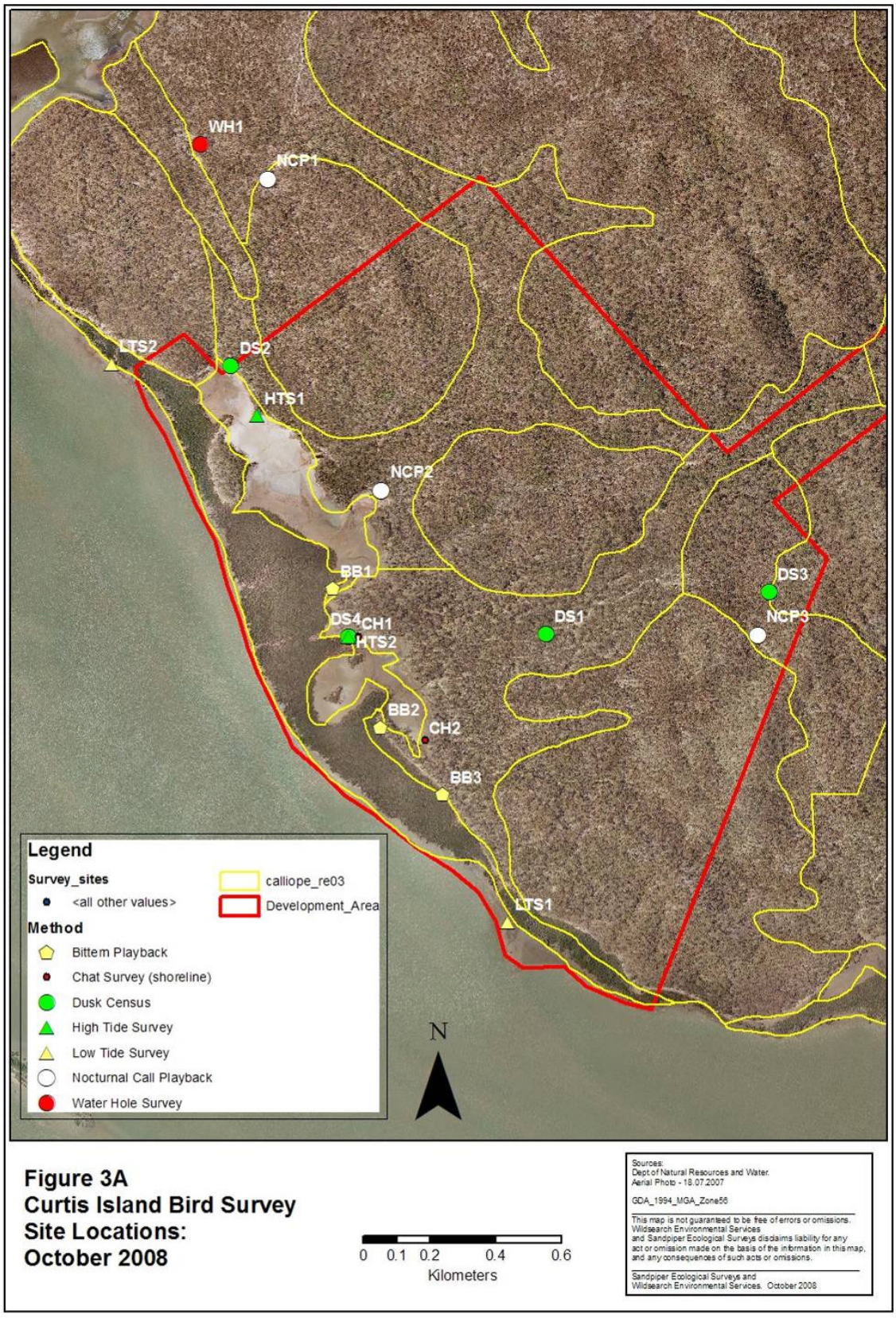


**Figure 3A**
**Curtis Island Bird Survey**
**Site Locations:**
**October 2008**


**Figure 4 Survey Transects: October 2008**

# 3. RESULTS

## 3.1 Weather Conditions

Weather conditions were good for conducting bird surveys, with fine, warm and humid conditions experienced on most mornings and evenings (Table A1, Appendix A). Wind was generally light, except for the dawn survey on 30 September and the nocturnal survey on 9 October when wind was strong. Light rain occurred prior to dusk surveys on 8 October but did not occur during any targeted surveys.

## 3.2 Survey Effort

A total of 144.5 person hours was spent sampling birds within the subject site, with an additional 42 person hours spent traveling to and from the site (Table 1).

Table 1: Survey effort expended sampling birds for the proposed British Gas Liquid Natural Gas Facility, Curtis Island. * does not include time spent traveling to and from the site. Travel time equates to an additional 42 person hours.

| Date | Person Hours* | Tasks |
|---|---|---|
| 29.9.08 | 12 | Site perusal, traverse |
| 30.9.08 | 16 | Area search, habitat assessment, traverse |
| 1.10.08 | 16 | Area search, habitat assessment, high tide survey, traverse |
| 2.10.08 | 17 | Area search, waterhole survey, dusk census, traverse |
| 3.10.08 | 19 | Shorebird survey (off-site), dusk census, call broadcast, traverse, waterhole survey |
| 6.10.08 | 17 | Area search, habitat assessment, dusk census, traverse, waterhole survey, high tide survey. |
| 7.10.08 | 19.5 | Area search, habitat assessment, dusk census, call broadcast, traverse, low tide survey. |
| 8.10.08 | 14 | Area search, habitat assessment, dusk census, call broadcast, traverse |
| 9.10.08 | 14 | Area search, traverse, habitat assessment, dusk census, call broadcast |

Table 2: Targeted survey techniques employed for threatened species

| Species | Area Search | Call Broadcast | Water hole Monitoring | Shoreline Transect | Dusk Census | Habitat Traverse |
|---|---|---|---|---|---|---|
| Red Goshawk | X | | | | X | X |
| Grey Goshawk | X | | | | X | X |
| Square-tailed Kite | X | | | | | X |
| Yellow Chat | | | | X | | X |
| Beach Stone-curlew | X | | | X | | X |
| Eastern Curlew | | | | X | | X |
| Black-breasted Button-quail | X | | | | | X |
| Black-throated finch | X | | X | | | X |
| Glossy Black-Cockatoo | X | | X | | | X |
| Powerful Owl | | X | | | X | X |
| Squatter Pigeon | X | X | X | | | X |
| Painted Honeyeater | X | | X | | | X |
| Black-chinned Honeyeater | X | | X | | | X |
| Turquoise Parrot | X | | X | | | X |
| Lewin's Rail | | | X | | | X |

## 3.3 Species Richness

A total of 92 bird species were recorded during the survey, with an additional four species recorded during subsequent visits to the study area (Table A3, Appendix A).

### 3.3.1 Diurnal Birds

The diurnal species recorded was typical of a late Spring early Summer survey. The highest species diversity, and abundance, was recorded in the Endangered Regional Ecosystem (RE) 12.3.3 / 12.3.7 - Forest Red Gum (*Eucalyptus tereticornis*) – Grey Ironbark (*Eucalyptus crebra*) (42 species) and in the Regional Ecosystem (RE) 12.11.6, - Lemon-scented Gum (*Corymbia citriodora*) / Grey Ironbark (*Eucalyptus crebra*) / (Peppermint (Eucalyptus exerta) (54 species). Bird species diversity in the saltmarsh and mangrove communities (RE – 12.1.3) was relatively low, 17 and 28 species respectively (Table A3, Appendix A).

During the first week of the survey, White-naped and White-throated Honeyeaters and Noisy Friarbirds, were relatively common in the Forest Red Gum woodlands where both the Forest Red Gums and Grey Ironbarks were flowering. This flowering event had almost finished by the completion of the survey. Honeyeater numbers declined significantly once flowering had ceased.

Seasonal migrants, such as the Forest Kingfisher and Leaden Flycatcher were common, particularly in the Forest Red Gum woodland / open forest and the Lemon-scented Gum / Grey Ironbark open forest. Both of these species were breeding at the subject site. Forest Kingfishers were frequently encountered excavating nest hollows in the numerous arboreal termitaria. These termitaria were also used by Laughing Kookaburras.

Small passerines such as thornbills, fairy-wrens and finches were rare at the subject site. Only two family groups of the Red-backed Fairy-wren were recorded. These were recorded from areas of dense Sida (*Sida* spp.), Acacia thickets and grasses adjacent to the main creek line that dissected the subject site. No thornbills or finches were recorded and only one Weebill was recorded.

The larger Cuckoos including the Eastern Koel, Channel-billed Cuckoo and Pheasant Coucal were common in all habitats other than the saltpan and mangrove shrublands. Channel-billed Cuckoos were observed on a number of occasions taking eggs from Noisy Friarbird and Australian Magpie nests. The Brush Cuckoo and Horsfield's Bronze-cuckoo were also recorded in low numbers.

Parrots and cockatoos were rare at the subject site. The Pale-headed Rosella was recorded on two occasions and the Galah was recorded flying over the subject site on a number of occasions. Rainbow Lorikeets and Scaly-breasted Lorikeets were recorded throughout the study area. These species were most abundant during the first week of the survey when the Forest Red Gum and Grey Ironbark were in flower. Pairs were recorded nesting in branch hollows of Forest Red Gum and occasionally Lemon-scented Gum. Their numbers decreased substantially once flowering had declined. Little Lorikeets were less common and were recorded infrequently during the first week of the survey.

No introduced bird species were recorded.

### 3.3.2 Nocturnal birds

Six species of nocturnal bird were recorded at the subject site, including Barking Owl, Powerful Owl, Southern Boobook, White-throated Nightjar, Australian Owlet-nightjar and the Bush Stone-curlew (Figure 5, Table A3, Appendix A). Three Barking Owl roost sites were located with one being an active nest site (Figure 5). The Barking Owl and Southern Boobook were relatively abundant and seemed to utilize all vegetation types (regional ecosystems) in the subject site.

Both species were recorded at all of the call broadcast sites - usually as unsolicited calls (Figure 3A).

The Barking Owl was initially recorded opportunistically during diurnal bird surveys, when a roost tree and nest site was found in the north-western parts of the subject site (Figure 5). Subsequently this pair was observed at this site on each day of the survey. Another pair of Barking Owls was observed roosting in dense Stilt Mangroves (*Rhizophora stylosa*) on the central western boundary of the subject site. This pair was roosting within the lower canopy of the mangroves - approximately 1.6m – 1.8m above ground level. A third pair was recorded roosting in a relatively densely vegetated gully in the south-eastern parts of the subject site. This roost may have been in one of a number of large dead trees found in this area. A large number of crown feathers from a Barking Owl were also found on a ridgeline on the south-western boundary of the site. Call Playback was not conducted for this species.

A single Powerful Owl responded to call broadcast. This bird was first heard calling from the gullies and ridges of the south-eastern quarter of the study site after calls were broadcast from a site on the western edge of the forest (Figure 3A - Site NCP2). A number of Sugar Glider (*Petaurus breviceps*) tails (three) were found during fauna feature traverses of the subject site. The tails of this prey-species are typically removed by Powerful Owls following capture and their occurrence suggests that the Powerful Owl forages widely across the subject site. However, Barking Owls are also known to take Sugar Gliders and these prey remains may be the result of predation by Barking rather than Powerful Owls. The authors are unsure whether or not Barking Owls remove the tails in the same manner as Powerful Owls.

The Southern Boobook was widespread throughout the study area with a minimum of four pairs calling each night. They appeared to be using all habitats and moved rapidly from their roost site once it was dark.

The Bush Stone-curlew was recorded at a number of sites. One bird was observed at 2ha Plot 20, whilst four birds were recorded at nocturnal call broadcast site NCP1 and two birds at dusk census site DC2. This species was also recorded opportunistically during travel to and from the subject site.

### 3.3.3 Estuarine birds

Four high tide and two low tide surveys were conducted within the subject site (Figure 4). Species diversity and abundance was low. A total of seven species was recorded (Table A3, Appendix A). These were: Whimbrel, Eastern Curlew, Pied Oystercatcher, Striated Heron, Crested Tern, Caspian Tern and Masked Lapwing. Three species were recorded during the high tide surveys (Whimbrel, Eastern Curlew, Masked Lapwing) and six species were recorded during the low tide surveys (Whimbrel, Eastern Curlew, Pied Oystercatcher, Striated Heron, Crested Tern, Caspian Tern). Maximum total numbers recorded was ten during a low tide survey on the 6.10.2008, with no estuarine birds recorded during a high-tide survey on the 6.10.2008.

By way of comparison, high tide counts conducted at a roost site immediately to the west of South End recorded a minimum of 1600 individuals of 16 species, including large flocks of Eastern Curlew, Whimbrel and Grey-tailed Tattler.

## 3.4 Bird Habitat

Four broad bird habitats occurred at the subject site (Figure 2). These were, Mangrove shrubland (RE: 12.1.3); Saltpan vegetation (RE: 12.1.2); Forest Red Gum (*Eucalyptus tereticornis*) woodland / open forest (RE: 12.3.3); Lemon-scented Gum (*Corymbia citriodora*) / Grey Ironbark (*Eucalyptus crebra*) open forest (RE:12.11.6); / Grey Ironbark / Forest Red Gum woodland (RE: 12.11.14). The majority of these habitats had been previously cleared or significantly disturbed. During the early 1900's much of the subject site had been developed as "soldier settlement"

blocks and used for cropping, dairy and horticultural activities (A. Smith pers comm). The structure and development of the vegetation and fauna habitat at the site reflects this previous use. There was no freshwater recorded within the subject site. The habitat characteristics have been summarised at Appendix A: Tables A5a and A5b.

*Mangrove shrubland (RE: 12.1.3):*

The mangrove shrublands form a dense and almost continuous fringe along the western boundary of the subject site (Figure 2). This habitat type is flooded during each high tide, although the depth of inundation varies. Overstorey vegetation is dominated by Stilt Mangroves (*Rhizophora stylosa*) to a height of four metres with a canopy cover of 70 – 80%. In other areas, Yellow Mangrove (*Ceriops tagal*), Grey Mangrove (*Avicennia marina*) and River Mangrove (*Aegicera corniculatum*) formed isolated thickets or occurred as scattered individuals The midstorey and understorey were generally open with shrubs absent or represented by scattered juveniles of the canopy species. Ground cover was dominated by sticky fine-grained marine mud.

Hollow logs were rare, however, hollow branches and other arboreal shelter sites were present at all sites. Flowering Stilt Mangroves and River Mangroves were recorded at all sites. Epiphites were rare. As expected, no evidence of fire was recorded, although some evidence of previous disturbance by feral horses and pigs was recorded. No weeds were recorded in this habitat.

*Saltpan Vegetation (RE: 12.1.2):*

The extensive open and bare marine clay saltpan habitats occurred immediately inland of the mangrove shrublands (Figure 2). Small herblands occurred as isolated patches within the saltpans and linear grassland fringes were found at the ecotone with the adjacent woodland habitats. These grasslands were dominated by Saltwater Couch (*Sporobolus virginicus*). The herblands were dominated by Jelly-bean Plant (*Suaeda* spp.) and Samphire (*Holosarcia* spp.). This habitat was subjected to tidal inundation, although major flooding only occurred at the highest of tides. No hollow logs were recorded within this habitat however, patches of dead mangroves were present. No evidence of fire was recorded, although evidence of long-term and heavy grazing of the Saltwater Couch by horses and cattle was evident. Grazing had severely impacted upon this habitat resulting in erosion and simplification of the vegetation structure and floristics. The herblands had been very heavily grazed and as a result occurred only as small isolated patches. The height of these grasslands and herbland species rarely exceeded 10cm. No weeds were recorded in this habitat.

*Forest Red Gum (Eucalyptus tereticornis) woodland / open forest (RE: 12.3.3):*

The Forest Red Gum woodlands / open forests occurred predominantly on the alluvial flats in the central parts of the study area (Figure 2). This habitat is listed as an Endangered Regional Ecosystem. These woodlands were dissected by a number of ephemeral creek lines where softwoods such as Cheese Tree (*Glochidion ferdinandi*), Red Ash (*Alphitonia excelsa*), *Waterhousia* spp., *Melaleuca* spp. and Burdiken Plum (*Pleiogynium timorense*) could be found. Overstorey vegetation was dominated by Forest Red Gums (*Eucalytpus tereticornis*) to a height of 18 – 20 metres and a canopy cover ranging from 20 – 25%. Grey Ironbark (*E. crebra*) and Morton Bay Ash (*Corymbia tessellaris*) occurred as scattered trees throughout. Midstorey vegetation was sparse, ranged in height from 9 to 10 metres and was dominated by Grey Ironbark, Forest Red Gum and Acacia spp. The understorey was dominated by thickets of Acacia spp. and Sida (*Sida* spp.) to a height of 2.5 metres. These dense thickets were the resulting of fires that had occurred within the past five years. Ground cover vegetation was dominated by native grasses to a height of 0.2 – 0.8 metres and cover ranging from 30 to 80%. Leaf-litter comprised 15 to 35% of the groundcover. There was no surface rock recorded within this habitat type. The soils appeared to be heavy clays.

Fallen branches and hollow logs were relatively common as were large hollow-bearing trees. These hollow-bearing trees were primarily Forest Red Gums. Other important fauna features recorded include: an abundance of seeding Acacias; relatively deep leaf litter, particularly under the Acacia and Sida thickets; the presence of decorticating bark on senescent Acacias and dead trees. Flowering Forest Red Gums and Grey Ironbarks (5 – 25% of trees) were also recorded throughout this habitat. This habitat had been previously cleared and has been regularly burnt. It is currently grazed by cattle and feral horses. A low level of weed infestation was recorded, primarily along the creek lines.

This habitat is of particular significance having a large number of large hollow-bearing trees, arboreal termitaria and seasonally important flowering gums.

*Lemon-scented Gum (Corymbia citriodora) / Grey Ironbark (Eucalyptus crebra) open forest (RE:12.11.6);*

The Lemon-scented Gum / Grey Ironbark open forest habitats dominated the ridges and slopes of the study area and, on the lower slopes, graded into Grey Ironbark / Forest Red Gum woodland (RE: 12.11.14) (Figure 2). Overstorey vegetation was dominated by Lemon-scented Gums, Grey Ironbarks with a canopy height ranging from 16 – 26 metres. Scattered other *Eucalytpus* spp. were also recorded. Canopy cover ranged from 15 – 60% with the majority of site having 25% cover. The midstorey was open and often sparse. Midstorey vegetation was dominated by the Lemon-scented Gum, Grey Ironbark, Queensland Peppermint (*E. exerta*) and Acacia spp. and ranged in height from 3 to 14 metres. The understorey was dominated by *Acacia* spp. and *Sida* spp. thickets with a height ranging between 2 and 5 metres and cover of between 20 and 60%. These thickets were most likely associated with past fire events. Ground cover varied greatly across the subject site and was dependent upon site position. Ground cover was sparse on the steeper, higher slopes and was dominated by tussock grasses (10 – 65% cover) and surface rock (5 – 30% cover). Leaf litter was extensive throughout but not well developed (<5cm depth) except under Acacia thickets. Dead Acacias and small trees with decorticating bark were common as were arboreal termitaria.

Fallen logs including those with hollows were frequently recorded. Hollow-bearing trees and near-mature Eucalypts with the potential to form hollows were patchily distributed across the study area. This patchiness most likely reflects past land use patterns. Much of this habitat had been previously disturbed by fire. The dominance of this habitat by young or regrowth trees is most likely associated with past clearing. Other important fauna features recorded include: abundant decorticating bark, mostly on dead Acacias; flowering Eucalypts and seeding Acacia. Low levels of weed infestations were recorded.

## 3.5 Butterflies

Twenty species of butterfly were recorded within the subject site (Table A4, Appendix 1). Most species were recorded within a variety of habitats. The highest abundance and species richness was recorded in Mangrove Shrubland and Forest Red Gum Woodland/Open Forest.

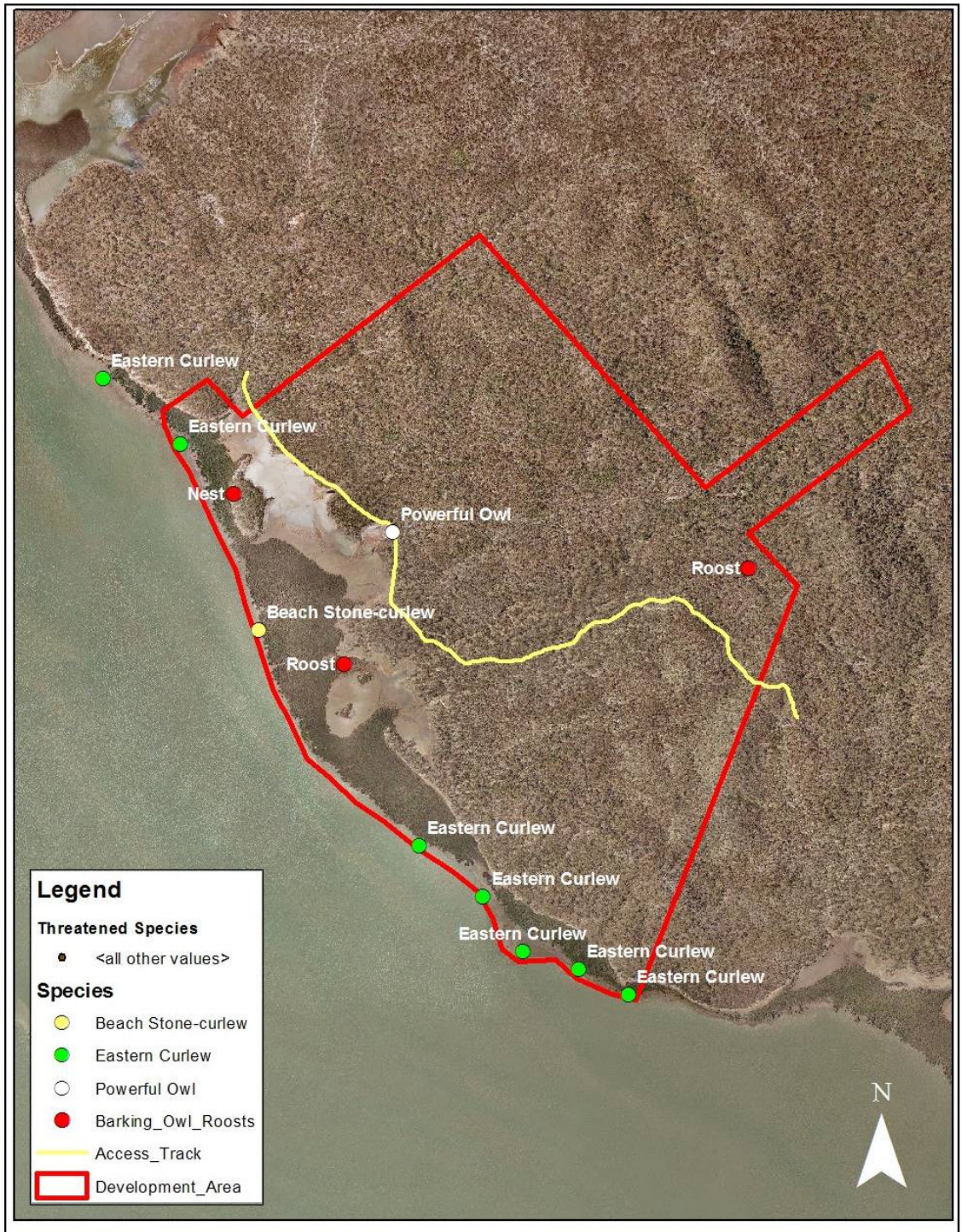


**Figure 5: Barking Owl and Threatened Species Locations. October 2008**

### 3.6 Threatened and Migratory Species

Three species listed on the *NC Act 1992* were recorded during the survey (Figure 5). These were: Powerful Owl and Beach Stone-curlew, both listed as Vulnerable; and Eastern Curlew, which is listed as Rare. No species listed as either Endangered or Vulnerable on the *EPBC Act 1999* were recorded. However, 15 migratory species, listed on the EPBC Act were recorded.

The Beach Stone-curlew was also observed on a number of occasions near the village of Curtis South and on the extensive tidal flats that occur along the south-eastern and southern shores of Curtis Island.

Targeted searches for the Endangered Yellow Chat were undertaken. These searches focused on the saltpan habitats at the subject site, particularly the Saltwater Couch vegetation. No Yellow Chats were recorded. The Saltpan vegetation was highly degraded and limited in extent.

Additional surveys targeted the Black-throated Finch and the Squatter Pigeon. Surveys methods included water-hole monitoring, habitat traverses and call broadcast (Refer Table 2). These species were not recorded.

## 4. DISCUSSION

### 4.1 Limitations

The survey was conducted during good weather conditions and when there was some blossom within the Forest Red Gum and Mangrove habitats. The lack of standing freshwater within the subject site may have affected the diversity and abundance of small passerines. Although the subject site does not appear to retain freshwater for long periods and the bird community recorded during the survey may be typical of 'normal' conditions.

A better indication of species richness could be obtained by incorporating greater temporal variation into the survey. Sampling in different seasons and environmental conditions would be ideal to fully document bird species diversity. Nonetheless, the survey was conducted during spring when many north-south migrant species had arrived and when there was some blossom present in the Mangrove and Woodland habitats. The level of survey effort and the attention focused on assessing bird habitat has been satisfactory to obtain a good idea of species richness during spring and to assess the likelihood of occurrence of threatened species.

### 4.2 Avifauna within the subject site

Bird species richness within the subject site is regarded as good for the location, habitat types present and the time of year. The bird community is regarded as typical of degraded woodland habitats in coastal central Queensland. The community was dominated by medium to large species that are common in woodland and degraded forests in the South East Queensland Bioregion. Species richness was appropriate given the floristic and structural diversity of habitats on the subject site and the distribution of flowering and fruiting plants.

Three notable aspects of the bird community were:

1. *Low species richness and abundance within the Mangrove Shrubland*. Given the abundance of (invertebrate) food within the Mangrove Shrubland and the contiguous nature of Mangrove Forest along the western shore of Curtis Island it was anticipated that mangroves on the subject site would have a diverse bird community. This was not the case and the mangrove bird community was comprised of 3-4 common species. Mangrove specialists, such as Mangrove Honeyeater and Mangrove Gerygone were rare on the subject site but reasonably common elsewhere on Curtis Island (pers obs). The reason for the low diversity and abundance of mangrove birds is unclear, although it could be due to the small amount of blossom, lack of Melaleucas and other flowering shrubs in the adjacent woodlands and possibly the area of mangrove forest.

2. *Low species richness and abundance of small passerines*. One notable feature of the bird community was the low abundance and diversity of small passerines, particularly finches, thornbills, gerygones and fairywrens. Habitat was suitable for small passerines with Acacia thickets and long grass occurring throughout the woodland community. The low diversity of small passerines is attributed to a combination of no standing fresh water and previous habitat disturbance. Freshwater is critical for many small passerines which often need to drink each day. Habitat disturbance, particularly clearing and fragmentation is known to favour more aggressive medium and large birds over smaller species. The site was dominated by aggressive species, such as Australian Magpie, Laughing Kookaburra, Pied Currawong, Rainbow Lorikeet and Noisy Friarbird. Interestingly, Noisy Miner, a notable aggressive species of disturbed forests and woodlands, was rare on the subject site.

3. *High abundance of nocturnal birds, particularly small forest owls*. Nocturnal birds, particularly Barking Owl and Southern Boobook, were abundant within the Woodland Habitat. Both White-throated Nightjar and Tawny Frogmouth were regularly recorded in certain parts of the site. The abundance of small forest owls is attributed to a good supply of large invertebrate prey and suitable nesting hollows. A brief scan of Barking Owl pellets beneath day roosts identified both invertebrate and vertebrate (small bird) remains. The abundance of nocturnal birds is mirrored by a similar abundance of large diurnal birds, such as Australian Magpie and Laughing Kookaburra, which also prey on small vertebrates and invertebrates.

## 4.3 Threatened Species Known or Predicted to Occur on the Subject Site

Fifteen threatened species of bird were identified as possibly occurring on the subject site (Table 3). The likelihood of each species using the subject site was assessed with reference to published information on habitat preferences and distribution. Three threatened species are known to occur in the subject site and two additional species have moderate likelihood of occurrence (Table 3). Square-tailed Kite and Black-chinned Honeyeater are predicted to have a moderate likelihood of occurrence based on habitat type and proximity of records (Marchant & Higgins 1993; Higgins 2001). The impact of the proposal on Known and Moderate species is assessed in the following section.

Yellow Chat was specifically targeted during the field survey. Despite targeted searches of saltpan habitat, particularly the Saltwater Couch vegetation, no Yellow Chats were recorded. Potential habitat was highly degraded and limited to a narrow fringe. According to Houston *et al.* (2004a & 2004b) Yellow Chats on Curtis Island utilise a mosaic of wetland habitat, including tall (>1.2m) rush-beds, areas of patchy rush and less dense salt couch and chenopod salt flats. Whilst both salt couch and chenopod salt flats occur on the subject site these areas are heavily grazed and are dominated by vegetation less than 10cm in height. Important refuge habitat in the form of rush-beds was also absent.

## 4.4 Impacts on birds

The proposal could affect birds in several ways, including:

- Removal of habitat.
- Disruption of movement corridors.
- Edge effects.
- Habitat fragmentation.

The subject site covers an area of approximately 279ha most of which will be highly modified to accommodate the LNG facility. Small pockets of vegetation that may remain within the property boundary will most likely be fragmented and isolated from contiguous vegetation and suitable only for a small number of more aggressive species. In the long-term habitat removal and infrastructure construction would provide more favourable conditions for edge tolerant species, such as Pied Currawong, Noisy Miner and possibly Common Myna (*Sturnus tristis*). Increased abundance of these species would affect the bird community in the adjoining habitat through aggressive interactions, nest predation and competition of food and nest sites. The proposal would remove most of the Forest Red Gum/Ironbark Woodland which represents an important foraging and nesting habitat for many species.

Table 3: Likelihood of occurrence of threatened species within the subject site. unlikely = the subject site does not contain habitat resources suitable for the subject species; low = the subject site has some attributes (i.e. habitat type) that are suitable for the subject species but key habitat attributes (i.e. nest, shelter and foraging sites) are absent; Medium = the subject site contains potential habitat and habitat attributes but the species is uncommon in the locality; High = the subject site contains potential habitat and habitat attributes and there are records nearby; Known = species recorded using the subject site during the field survey.

| Species | Likelihood of Occurrence | Reason |
|---|---|---|
| Red Goshawk | Low | Habitat lacks permanent water and there is a low abundance of potential prey. |
| Grey Goshawk | Unlikely | No suitable habitat; species prefers moist forests. |
| Square-tailed Kite | Moderate | Suitable habitat and known occurrence in the Gladstone area; low abundance of passerines may result in large home range. |
| Yellow Chat | Unlikely | No suitable habitat (Houston *et al.* 2004a & 2004b); saltmarsh habitat is limited in area, and highly degraded due to grazing by cattle and horses. |
| Beach Stone-curlew | Known | Recorded flying along channel adjacent to the subject site; predicted to roost on small mangrove island west of the subject site and may use the mangrove fringe within the site for foraging. |
| Eastern Curlew | Known | Recorded roosting and foraging on the subject site; small number of individuals (3) forage on intertidal mudflats at low tide and within the claypan habitat at high tide. |
| Black-breasted Button-quail | Unlikely | No potential habitat present on the subject site. |
| Glossy Black-Cockatoo | Low | Potential feed trees (i.e. *Allocasuarina* spp) are rare on the subject site; and no evidence (i.e. chewed cones) of foraging was recorded during the survey. |
| Black-throated finch | Low | Potential habitat is present but absence of freshwater reduces the likelihood of occurrence. |
| Powerful Owl | Known | Predicted to forage over much of the subject site. |
| Squatter Pigeon | Unlikely | Habitat is not suitable due to prevalence of long dense grass and absence of permanent water (Higgins & Davies 1996). |

| | | |
|---|---|---|
| Painted Honeyeater | Unlikely | Subject site is outside normal range (Barrett *et al.* 2003; Higgins *et al.* 2001); Mistletoe was very rare on the subject site. |
| Black-chinned Honeyeater | Moderate | Habitat has some suitable attributes but dominant flowering Eucalypts differ to typical habitat (Higgins *et al.* 2001) |
| Turquoise Parrot | Unlikely | Habitat is unsuitable and site is situated outside normal range (Barrett *et al.* 2003; Higgins 1999). |
| Lewin's Rail | Unlikely | No suitable habitat occurs on the subject site. |

The removal of woodland habitat is unlikely to disrupt bird movement corridors or isolate large areas of habitat as similar habitat surrounds the subject site. The construction of a wharf will fragment mangrove habitat and partially disrupt movement by birds that use the mangrove fringe to move between larger tracts of mangrove habitat. Many species of mangrove passerine are cover dependent and prefer to remain within vegetation, nonetheless these species are regarded as capable of traversing the small gap created by the wharf.

The proposal may have a positive benefit on saltmarsh habitat as horses and cattle would most likely be excluded from the subject site and pigs controlled. At present horses and cattle cause serious degradation of Saltmarsh and there removal would enable parts of this habitat to rehabilitate.

The magnitude of impacts on birds is reduced by the quality and diversity of existing habitat and site management. The subject site has previously been cleared and consists predominantly of regrowth vegetation. Frequent fires have removed small pockets of moist forest and contributed to a homogenised habitat. The absence of permanent water reduces the suitability of habitat for a variety of species.

### 4.4.1 Impact on Threatened Species Listed on the NC Act

*Impact on the Local Population of a Threatened Species*

*Beach Stone-curlew* – A pair of Beach Stone-curlews were recorded flying along the edge of the site at dusk on one evening of the survey. This pair may occasionally forage along the mangrove fringe adjacent to the subject site and is suspected to roost on the small island to the west of the site. There is no evidence that Beach Stone-curlews roost or nest on the subject site. The proposal would disturb a small area of potential foraging habitat; however, it is predicted that Beach Stone-curlews would continue to forage near the subject site although they may avoid areas of high activity. The proposal would cause a slight reduction in the area of foraging habitat but similar habitat is widespread in the locality.

*Eastern Curlew* – Small numbers of Eastern Curlews (up to 3 during the survey) forage on the subject site at high and low tide. The proposal would make the claypan habitat unsuitable for foraging, but birds may continue to use the mudflats along the mangrove fringe at low tide. A small number of Eastern Curlews may need to find an alternate high tide foraging site. Whilst there are substantial areas of similar habitat in the locality this habitat may already be used at high tide and it is therefore impossible to conclude that the displaced birds would simply relocate to other areas even though this may occur. Even under a worst case scenario where displaced birds are unable to find alternative habitat and perish the impact would be minor as the subject site is used by a very small proportion (i.e. 0.002% based on Driscoll 1997) of the Eastern Curlew population within the Curtis Coast Region.

*Powerful Owl* – The subject site represents part of a foraging home range used by one, possibly two, Powerful Owls. Sugar Gliders are common arboreal mammals and often dominate the prey items taken by these large forest owls (Higgins 1999). The observation of three widely spaced Sugar Glider tails suggests that Powerful Owls forage over most of the subject site on a regular basis. However, this observation needs to be qualified as Barking Owls are also known to take

Sugar Gliders and these prey remains may be the result of predation by Barking rather than Powerful Owls (Higgins 1999). The authors are unsure whether or not Barking Owls remove the tails in the same manner as Powerful Owls.

Habitat within the subject site is not suitable for roosting and it predicted that owl/s using the site may roost in vine thickets to the east (Higgins 1999). No potential nest sites (i.e. large hollows in live Eucalypt) were recorded within the subject site during the field survey.

Given the nature of habitat within and surrounding the subject site and the low abundance of arboreal mammals (refer to mammal survey results) it is predicted that a resident owl, or pair of owls, would have a large home range possibly up to 1500ha (Higgins 1999). If a home range of 1500ha is assumed then the proposal would remove 13% of this area. Nearby development may remove a similar area of habitat and the cumulative effect may be detrimental to a resident individual or pair. Although dry open woodland is widespread on Curtis Island the distribution of Powerful Owls is unknown and it cannot be assumed that owls displaced from the subject site would simply adjust their home range to include other habitat. Exacerbating the magnitude of impact is that Curtis Island is situated near the northern limit of the known distribution of Powerful Owl (Higgins 1999).

*Square-tailed Kite* – Square-tailed Kites are known to occur in the Gladstone area and habitat within the subject site is suitable for foraging and nesting (Marchant & Higgins 1993). Use of the site by kites would be influenced by the abundance of small birds and may be greatest during peak flowering periods when honeyeaters are most abundant. The field survey was conducted during the breeding season and at a time when small passerines (i.e. friarbirds and white-naped honeyeaters) were relatively abundant. Due to their conspicuous nature and the level of survey effort it is highly likely that, if present, Square-tailed Kites would have been recorded. Use of the subject site may be restricted to occasional foraging outside the breeding season. Given the large area of similar quality foraging habitat on Curtis Island and the adjoining mainland it is unlikely that habitat removal associated with this project would affect the viability of the local Square-tailed Kite population.

*Black-chinned Honeyeater* - If present, the Black-chinned Honeyeater is likely to be an uncommon visitor to the study area and would most likely to occur during peak flowering periods of Grey Ironbark and Forest Red Gum (Higgins *et al.* 2001). Given their scattered distribution in eastern Queensland and the abundance of similar habitat in the locality detrimental impacts on the viability of the local Black-chinned Honeyeater population are unlikely.

*Impact on the Habitat of a Threatened Species*

The proposal would remove approximately 250ha of Open Woodland that is suitable for three threatened bird species and cause disturbance to, or remove, intertidal habitat used by Eastern Curlew and possibly Beach Stone-curlew. In a broad context the habitat affected is common and widespread in the Curtis Coast region and the effect of habitat removal would be minor. However, the Forest Red Gum Woodland/Open Forest Regional Ecosystem which dominates the alluvial flats within the subject site is listed as endangered. This community provides habitat for a variety of species, including foraging habitat for Powerful Owls, Square-tailed Kites and Black-chinned Honeyeaters. According to the Forest Ecosystem Map Forest Red Gum Woodland appears to be patchily distributed across the southern end of Curtis Island and it is likely that Forest Red Gum is a component of other Regional Ecosystems that occur in different topographic positions on the island and adjoining mainland. Similar habitat is predicted to be widespread in the vicinity of the subject site. The proposal is unlikely to fragment woodland habitat on Curtis Island although small patches of vegetation retained within the subject site may become isolated from areas off site.

*Does the Proposal Constitute a Threatening Process*

Vegetation removal is recognised as a threatening process. The proposal would remove approximately 250ha of Open Woodland and reduce the area of habitat available for a range of common and threatened bird species. Apart from potential benefits to Common Myna the proposal would not increase the abundance or distribution of pest species. The proposal would reduce the local impacts of horses, cattle and possibly pigs by excluding these species from the site. This would have positive benefits to vegetation and bird habitat.

*Summary*

The proposal will remove (or effectively isolate) approximately 250ha of Open Woodland habitat and cause disturbance to adjoining (woodland & intertidal) habitat. All of the identified threatened species are known or predicted to occur in low numbers within the subject site. The proposal is unlikely to have a detrimental effect on the viability of local populations of Beach Stone-curlew, Eastern Curlew, Square-tailed Kite and Black-chinned Honeyeater. Powerful Owl may be detrimentally affected through cumulative habitat removal. This conclusion is based on a limited understanding of the distribution of Powerful Owls on Curtis Island.

### 4.4.2 Impact on Matters of National Environmental Significance

In accordance with the requirements of the EPBC Act the short-term impacts of the proposal on Matters of National Environmental Significance were assessed. The 'Matters of National Environmental Significance' listed in the EPBC Act include:

- World Heritage Areas;
- Wetlands protected by international treaty (The Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species;
- All nuclear actions; and
- The environment of Commonwealth marine areas.

The proposal would not impact on any World Heritage Areas, Ramsar wetlands, nationally listed threatened species, involve any nuclear actions or impact on any Commonwealth marine areas[1]. The subject site is known to be used by 15 species that satisfy the definition of 'migratory species' as per the EPBC Act (Table 4).

In accordance with the EPBC Act Administrative Guidelines on Significance, with respect to migratory species, it is necessary to determine if habitat affected by the proposal is "important habitat". Important habitat is defined as:

- Habitat utilise by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
- Habitat utilised by a migratory species which is at the limit of the species range, or
- Habitat within an area where the species is declining.

[1] Note that this assessment deals only with the proposed LNG loading and storage facility on Curtis Island and note issues associated with the adjoining marine environment.

The subject site is not situated at the limits of range for any of the identified migratory species (Table 4). The only species that occur in significant numbers in the survey region are Bar-tailed Godwit, Eastern Curlew and Whimbrel (Driscoll 1997). The Curtis Coast region supports 6%, 8% and 4% of the statewide populations of Bar-tailed Godwit, Eastern Curlew and Whimbrel respectively. Eastern Curlew is regarded as the only migratory species occurring in the subject site that may be declining. This conclusion is based on its 'rare' classification on the NC Act. Apart from the abovementioned species, all of the remaining migratory species are common within the locality and region and many Australian representatives of the families included within the act may not be true migrants within Australia. These species have not been considered further in this assessment.

The assessment of significance (Appendix B) concluded that the proposal would not have a significant impact on migratory species, due to:

- the small number of individuals that utilise the subject site;
- the low quality of habitat within the subject site compared to nearby habitat; and
- the likelihood that small numbers of birds would continue to utilise parts of the site during the construction and operational phases of the project;

Therefore the proposal does not require referral to the Federal Department of the Environment, Water, Heritage and the Arts.

Table 4: Migratory species recorded on the subject site.

| Common Name | Region Supports Ecologically Significant Proportion of Population | Limit of the Species Range | Area where a species is declining |
|---|---|---|---|
| Pacific Black Duck | no | no | no |
| Great Egret | no | no | no |
| Pacific Baza | no | no | no |
| Whistling Kite | no | no | no |
| Brown Goshawk | no | no | no |
| Brahminy Kite | no | no | no |
| Eastern Osprey | no | no | no |
| White-bellied Sea-eagle | no | no | no |
| Australian Hobby | no | no | no |
| Bar-tailed Godwit | Yes | no | No |
| Eastern Curlew | Yes | no | Yes |
| Whimbrel | Yes | no | no |
| Masked Lapwing | no | no | no |
| Caspian Tern | no | no | no |
| Rainbow Bee-eater | no | no | no |

# 5. RECOMMENDATIONS

The following recommendations are proposed to minimise impacts on birds and where possible improve habitat value. Additional surveys are recommended for Powerful Owl to obtain a better indication on the distribution of this species on Curtis Island and allow a more informed assessment of impacts.

- Cattle, horses and pigs should be excluded from the subject site as soon as practical to reduce grazing pressure on saltmarsh and general habitat degradation.
- Vehicles should be excluded from saltmarsh habitat except for designated access tracks. In genera, Saltmarsh should be protected to allow natural rehabilitation.
- Protect all known roost and nests sites of the Barking Owl.
- Minimise disturbance to the mangrove communities.
- Retain the saltmarsh and mudflat habitats and control as required the encroachment of mangroves into these communities;
- Minimise vegetation removal and, where possible, retain large hollow-bearing habitat trees. The distribution of hollow-bearing trees should be mapped to assist in site planning.
- Undertake additional targeted surveys for Powerful Owl to obtain a better understanding of their distribution on Curtis Island. This survey should be undertaken during favourable conditions in the early stages of the breeding season i.e. April-May.

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# APPENDIX A

Table A1: Summary of survey effort.

| Method | Number of Sites | Total time / area/ transect length | Regional Ecosystem Sampled |
|---|---|---|---|
| 2ha Area Searches | 30 | 640mins | 12.11.6 / 12.11.14, 12.3.3 / 12.3.7, 12.11.6 |
| High Tide Surveys | 2 | 2x 2698m | 12.1.2 |
| Low Tide Surveys | 2 | 2x 2698m | 12.1.2 |
| Shoreline Survey | 2 | 2x 1881m | 12.1.2 |
| Nocturnal Call Playback | 3 | 2 nights / 158mins | 12.11.6 / 12.11.14, 12.11.6 |
| Bittern Call Playback Surveys | 3 | 60mins | 12.1.3 |
| Dusk Census | 4 | 6x20m | 12.3.3 / 12.3.7, 12.11.6 / 12.11.14, |
| Habitat Assessments | 30 | 30x (25mx25m) plots | 12.11.6 / 12.11.14, 12.3.3 / 12.3.7, 12.11.6 |
| Fauna Feature Traverse | | 9 days | 12.11.6 / 12.11.14, 12.3.3 / 12.3.7, 12.11.6 12.1.2 12.1.3 |
| Waterhole Surveys | | 3 x 60mins | |

Table A2: Weather conditions experienced during the field survey. Temperature and Relative Humidity were recorded using a Kestrel 3000 pocket weather meter. RL = rustles leaves, MSB = moves small branches, MLB = moves large branches, * = measured at midday.

| Date | Cloud Cover (%) | | Temperature ($^0$C) | | Relative Humidity (%) | | Wind | | Rainfall | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dawn | Dusk | Dawn | Dusk | Dawn | Dusk | Dawn | Dusk | Dawn | Dusk |
| 29.9.08* | Nil | | 31 | | 43 | | MSB | | Nil | |
| 30.9.08 | Nil | | 20.5 | | 81 | | MLB | | Nil | |
| 1.10.08 | 70 | | 20.4 | | 76 | | Nil | | Nil | |
| 2.10.08 | 45 | 1 | 17.5 | 22.4 | 86 | 71 | RL | RL | Nil | Nil |
| 3.10.08 | 1 | 10 | 21.3 | 22.2 | 77 | 69 | RL | RL | Nil | Nil |
| 6.10.08 | 5 | | 19.9 | | 76 | | Nil | | Nil | |
| 7.10.08 | Nil | 5 | 21.3 | 24.7 | 81 | 67 | RL | MSB | Nil | Nil |
| 8.10.08 | 40 | 80 | 23.3 | 24.2 | 77 | 82 | Nil | RL | Nil | Light |
| 9.10.08 | 80 | 80 | 23.6 | 23.1 | 85 | 79 | Nil | MLB | Prev 24hr | Prev 24hr |

Table A3: Birds recorded during October 2008. Nomenclature follows Christidis and Boles (2008). * bold text = species listed on the NC Act 1992; # = migratory species listed on the EPBC Act 1999.

| Common Name | Scientific Name | Regional Ecosystem and Remnant Vegetation Cover | Number of 2ha Plots |
|---|---|---|---|
| Australian Brush-turkey | Alectura lathami | 12.11.6 / 12.11.14 | 1, general list |
| #Pacific Black Duck | Anus superciliosa | 12.11.6 / 12.11.14 | general list |
| Little Black Cormorant | Microcarbo melanoleucos | 12.1.2 / open water | general list |
| Pied Cormorant | Phalacrocorax varius | 12.1.2 / open water | general list |
| Australian Pelican | Pelecanus conspicillatus | 12.1.2 / open water | general list |
| White-faced Heron | Egretta novaehollandiae | 12.1.2, 12.1.3 | general list |
| Little Egret | Egretta garzetta | 12.1.2, 12.1.3 | 1, general list |
| #Great Egret | Ardea alba | 12.1.3, 12.1.2 | general list |
| Black Bittern | Ixobychus flavicollis | 12.1.3 | poss. sighting |
| Striated Heron | Butorides striatus | 12.1.3 | 1, general list |
| Australian White Ibis | Threskiornis molucca | 12.1.2, 12.1.3 | general list |
| #Pacific Baza | Aviceda subcristata | 12.11.6, 12.11.6/12.11.14 | general list |
| #Whistling Kite | Haliastur sphenura | 12.11.6 / open water | general list |
| #Brown Goshawk | Acciptera fasciatus | 12.11.6, 12.3.3 / 12.3.7 | 3, general list |
| #Brahminy Kite | Haliastur indus | 12.1.3 / open water | 1, general list |
| #Eastern Osprey | Pandion cristatus | 12.1.3 / open water | general list |
| #White-bellied Sea-eagle | Haliaeetus leucogaster | 12.1.3 / open water | 1, general list |
| #Australian Hobby | Falco longipennis | 12.1.2, 12.11.6 | General list |
| Bush Stone-curlew | Burhinus grallarius | 12.11.6, 12.11.6/12.11.14 | 1, general list |
| *** Beach Stone-curlew** | **Esacus magnirostris** | 12.1.3 | general list |
| Painted Button-quail | Turnix varia | 12.11.6, 12.11.6/12.11.14 | general list |
| Red-backed Button-quail | Turnix maculosa | 12.11.6, 12.11.6/12.11.14 | 4, general list |
| #Bar-tailed Godwit | Limosa lapponica | 12.1.2, 12.1.3 | general list |
| *** # Eastern Curlew** | **Numenius madagascariensis** | 12.1.2, 12.1.3 | 2, general list |
| #Whimbrel | Numenius phaeopus | 12.1.2, 12.1.3 | 3, general list |
| Australian Pied Oystercatcher | Haematopus longirostris | 12.1.2, 12.1.3 | general list |
| #Masked Lapwing | Vanellus miles | 12.1.2, 12.1.3 | 3, general list |
| Silver Gull | Chroicephalus novaehollandiae | open water | general list |
| #Caspian Tern | Hydroprogne caspia | open water | general list |
| Gull-billed Tern | Gelochelidon nilatica | open water | general list |
| Crested Tern | Thalacceus bergii | open water | general list |
| Peaceful Dove | Geopelia striata | 12.3.3 / 12.3.7 | 3, general list |
| Bar-shouldered Dove | Geopelia humeralis | 12.3.3 / 12.3.7, 12.11.6/ 12.11.14, 12.11.6 | 6, general list |
| Crested Pigeon | Ocyphaps lophotes | 12.3.3 / 12.3.7 | general list |
| Red-tailed Black-cockatoo | Calyptorhynchus banksii | 12.11.6 | 1, general list |
| Galah | Eolophus roseicapillus | 12.3.3 / 12.3.7, 12.1.3 | general list |
| Rainbow Lorikeet | Trichoglossus haematodus | 12.11.6 , 12.3.3/ 12.3.7, 12.11.6/12.11.14, 12.1.3 | 23, general list |
| Scaly-breasted Lorikeet | Trichoglossus chloropidotus | 12.11.6 , 12.3.3/ 12.3.7, 12.11.6/12.11.14, 12.1.3 | 13, general list |

Table A3 cont.

| Common Name | Scientific Name | Regional Ecosystem and Remnant Vegetation Cover | Number of 2ha Plots |
|---|---|---|---|
| Little Lorikeet | Glossopsitta pusilla | 12.11.6 , 12.3.3/ 12.3.7, 12.11.6/12.11.14, 12.1.3 | 3, general list |
| Pale-headed Rosella | Platycercus adscitus | 12.3.3 / 12.3.7 | 2, general list |
| Brush Cuckoo | Cacomantis variolosus | 12.11.6, 12.11.6/12.11.14, 12.3.3/12.3.7 | general list |
| Horsfield's Bronze-cuckoo | Chalcites basilis | 12.11.6, 12.11.6/12.11.14, 12.3.3/12.3.7 | general list |
| Eastern Koel | Eudynamys orientalis | 12.11.6, 12.11.6/12.11.14, 12.3.3/12.3.7 | 1, general list |
| Channel-billed Cuckoo | Scythrops novaehollandiae | 12.11.6, 12.11.6/12.11.14, 12.3.3/12.3.7 | 7, general list |
| Pheasant Coucal | Centropus phasianinus | 12.11.6, 12.11.6/12.11.14, 12.3.3/12.3.7 | general list |
| *** Powerful Owl** | **Ninox strenua** | 12.11.6, 12.11.6/12.11.14 | general list |
| Barking Owl | Ninox connivens | 12.11.6 , 12.3.3/ 12.3.7, 12.11.6/12.11.14, 12.1.3 | general list |
| Southern Boobook | Ninox novaeseelandiae | 12.11.6 , 12.3.3/ 12.3.7, 12.11.6/12.11.14 | general list |
| Tawny Frogmouth | Podargus strigoides | 12.3.3 / 12.3.7 | general list |
| Australian Owlet-nightjar | Aegotheles cristatus | 12.3.3 / 12.3.7 | general list |
| White-throated Nightjar | Eurostopodus mystacalis | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | general list |
| Laughing Kookaburra | Dacelo novaeguineae | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 23, general list |
| Blue-winged Kookaburra | Dacelo leachii | 12.3.3 / 12.3.7 | 2, general list |
| Forest Kingfisher | Tadiramphus macleayii | 12.11.6, 12.11.6/12.11.14, 12.3.3/12.3.7 | 14, general list |
| # Rainbow Bee-eater | Merops ornatus | 12.3.3/12.3.7, 12.1.3 | general list |
| Dollarbird | Eurystomus orientalis | 12.11.6 / 12.11.14 | 5, general list |
| Red-backed Fairy-wren | Malurus melanocephalus | 12.3.3 / 12.3.7 | general list |
| Spotted Pardalote | Pardalotus punctatus | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 8, general list |
| Striated Pardalote | Pardalotus striatus | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 2 |
| White-browed Scrubwren | Sericornis frontalis | 12.11.6 /12.11.14 | general list |
| Brown Thornbill | Acanthiza pusilla | 12.11.6 /12.11.14 | general list |
| Weebill | Smicrornis brevirostris | 12.11.6 /12.11.14 | 2 |
| Noisy Friarbird | Philemon corniculatus | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 21, general list |
| Striped Honeyeater | Plectorhyncha lanceolata | 12.3.3/ 12.3.7 | general list |
| Blue-faced Honeyeater | Entomyzon cyanotis | 12.3.3 / 12.3.7 | general list |
| Noisy Miner | Manorina melanocephala | 12.3.3 / 12.3.7 | general list |
| Mangrove Honeyeater | Lichenostomus fasciogularis | 12.1.3 | general list |
| White-throated Honeyeater | Melithreptus albogularis | 12.11.6 / 12.11.14, 12.3.3/12.3.7 | 1, general list |
| White-naped Honeyeater | Melithreptus lunatus | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 19, general list |
| Brown Honeyeater | Lichmera indistincta | 12.1.3 | general list |
| Varied Sitella | Daphoenositta chrysoptera | 12.11.6 / 12.11.14, 12.11.6 | 4 |
| Rufous Whistler | Pachycephala rufiventris | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 8, general list |
| Grey Shrike-thrush | Colluricincla harmonica | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 6 |
| Little Shrike-thrush | Colluricincla megarhyncha | 12.1.3 | 1, general list |

Table A3 cont.

| Common Name | Scientific Name | Regional Ecosystem and Remnant Vegetation Cover | Number of 2ha Plots |
|---|---|---|---|
| Spectacled Monarch | Symposiarchus trivirgatus | 12.11.6 | 1 |
| Black-faced Monarch | Monarcha melanopsis | 12.11.6 / 12.11.14 | 1 |
| Leaden Flycatcher | Myiagra rubecula | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 17, general list |
| Rufous Fantail | Rhipidura rufifrons | 12.11.6 / 12.11.14 | 1 |
| Black-faced Cuckoo-shrike | Coracina novaehollandiae | 12.11.6 / 12.11.14 | 1, general list |
| White-bellied Cuckoo-shrike | Coracina papuensis | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 3, general list |
| Olive-backed Oriole | Oriolus sagittatus | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 2, general list |
| White-breasted Wood-swallow | Artamus leucorynchus | 12.1.3 | 1 |
| Grey Butcherbird | Cracticus torquatus | 12.11.6, 12.3.3 / 12.3.7 | 5, general list |
| Pied Butcherbird | Cracticus nigrogularis | 12.11.6 | 5, general list |
| Australian Magpie | Gymnorhina tibicens | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 18, general list |
| Pied Currawong | Strepera graculina | 12.3.3 / 12.3.7, 12.11.6, 12.11.6 /12.11.14 | 6, general list |
| Spangled Drongo | Dicrurus bracteatus | 12.1.3, 12.11.6, 12.11.6/12.11.14 | 9, general list |
| Torresian Crow | Corvus orru | 12.11.6 | 0, general list |
| White-winged Chough | Corcorax melanorhamphos | 12.3.7/12.3.3, 12.11.6 | 3, general list |
| Australasian Pipit | Anthus novaeseelandiae | 12.1.2 | 0, general list |
| Olive-backed Sunbird | Nectarinia jugularis | 12.1.3 | 1 |
| Mistletoebird | Dicaceum hirundinaceum | 12.3.7/12.3.3, 12.11.6 | general list |
| Welcome Swallow | Hirundo neoxena | 12.1.3 | 6, general list |
| Tree Martin | Hirundo nigricans | 12.11.6 | 2, general list |
| Fairy Martin | Hirundo ariel | 12.11.6 | general list |
| Silvereye | Zosterops lateralis | 12.3.3 / 12.3.7 | general list |

Table A4: Butterflies recorded within the subject site during opportunistic surveys between 29.9.08 and 9.10.08. Nomenclature follows Braby (2004).

| Family | Common Name | Scientific Name | Regional Ecosystem and Remnant Vegetation Cover |
|---|---|---|---|
| Papilionidae | Chequered Swallowtail | *Papilio demoleus* | 12.3.3; 12.11.6 |
| | Dainty Swallowtail | *Papilio anactus* | 12.3.3; 12.11.6 |
| | Clearwing Swallowtail | *Cressida cressida* | 12.3.3; 12.11.6 |
| Pieridae | Lemon Migrant | *Catopsilia pomona* | 12.1.2; 12.3.3 |
| | Grass Yellow | *Eurema* spp. | 12.3.3 |
| | Black Jezebel | *Delias nigrina* | 12.1.3 |
| | Caper White | *Belenois java* | 12.3.3 |
| Nymphalidae | Evening Brown | *Melantis leda* | 12.3.3; 12.11.6 |
| | Orange Ringlet | *Hypochsta adiante* | 12.1.3 |
| | Glasswing | *Acraea andromacha* | 12.1.3; 12.11.6; 12.3.3 |
| | Varied Eggfly | *Hypolimnas bolina* | 12.3.3; 12.11.6 |
| | Meadow Argus | *Junonia villida* | 12.1.3; 12.3.3; 12.11.6; 12.1.2 |
| | Australian Painted Lady | *Vanessa kershawi* | 12.1.3 |
| | White-banded Plane | *Phaedyma shepherdi* | 12.3.3; 12.11.6 |
| | Common Crow | *Euploea core* | 12.1.3; 12.3.3 |
| | Lesser Wanderer | *Danaus chrysippus* | 12.1.3; 12.3.3; 12.11.6 |
| | Monarch | *Danaus plexippus* | 12.1.2; 12.3.3 |
| | Blue Tiger | *Tirumala hamata* | 12.1.2; 12.1.3; 12.3.3 |
| Lycaenidae | Satin Azure | *Ogyris amaryllis* | 12.1.3 |
| | Small Dusky Blue | *Candalides erinus* | 12.11.6 |

Table A5a: Fauna Habitat – Site Characteristics, survey quadrats, Curtis Island, October 2008

Key: Adv. = advanced; Regen. = regeneration; m = metres; yr = years;

| Site Number | Regional Ecosystem | Slope | Disturbance History | | | | | | Vegetation Structure and Floristics | | | | Age Structure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Fire | Logging | Clearing | Grazing | Weeds | Flooding | Overstorey Height, % Cover, Dominant sp. | Midstorey Height, % Cover, Dominant sp | Understorey Height, % Cover, Dominant sp | Groundcover Height, % Cover, Dominant sp | |
| 1 | 12.3.3 / 12.3.7 | 0 | Light (5-10yr) | Nil | Severe (>10yrs) | Moderate (Current) | Nil | Nil | 20m, 25%, E. tereticornis | 9m, 10%, E. crebra | 2m, 30%, Acacia spp | 0.2m, 55% Grasses | Adv. Regen. |
| 2 | 12.3.3 / 12.3.7 | 3 | Mod (1-5yrs) | Nil | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 22m, 25%, E. tereticornis | 13m, 20% Eucs / Acacia | 2m, 40%, Acacia spp | 0.3m, 75% Grasses | Adv. Regen. |
| 3 | 12.3.3 / 12.3.7 | 5 | Mod (1-5yrs) | Nil | Severe (>10yrs) | Moderate (Current) | Light (Current) | Nil | 18m, 25%, E. crebra | 8m, 15%, Acacia spp. | 2m, 30%, Acacia spp | 0.4m, 75% Grasses | Adv. Regen. |
| 4 | 12.11.6 / 12.11.14 | 3 | Light (>10yrs) | Nil | Nil | Light (Current) | Nil | Nil | 12m, 15%, C. crebra | 6m, 10% Red Ash | 1m, 25%, | 0.3m, 55% Grasses | Mature Age |
| 5 | 12.11.6 | 5 | Light (1-5yrs) | Nil | Severe (>10yrs) | Light (Current) | Nil | Nil | 16m, 20%, C. citriodora | 8m, 15%, Acacia spp. | 2m, 10%, | 0.5m, 40% Grasses | Adv. Regen. |
| 6 | 12.11.6 | 20 | Mod (1-5yrs) | Nil | Severe (>10yrs) | Light (Current) | Nil | Nil | 20m, 20%, C. citriodora | 12m, 20%, E. crebra | 2.5m, 55%, Acacia spp | 0.5m, 50% Grasses | Adv. Regen. |
| 7 | 12.11.6 | 7 | Mod (1-5yrs) | Light (>10yrs) | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 22m, 20%, C. citriodora | 13m, 15% Eucs / Acacia | 2m, 80%, Acacia spp | 0.7m, 25% Grasses | Uneven Age |
| 8 | 12.3.7 / 12.3.11 | 8 | Mod (1-5yrs) | Light (>10yrs) | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 22m, 30%, C. citriodora | 13m, 10% Eucs. | 2m, 45%, Acacia spp | 1m, 60% Grasses | Uneven Age |
| 11 | 12.1.3 | 0 | 0 | Nil | Nil | Nil | Nil | Nil | 4m, 80%, Rhizophora | Nil | 2m, 15%, Rhizophora | Mud | Uneven Age |
| 12 | 12.1.3 | 0 | 0 | Nil | Nil | Nil | Nil | Nil | 6m, 75%, Rhizophora | Nil | 1.5m, 5%, Rhizophora | Mud | Uneven Age |
| 13 | 12.1.3 | 0 | 0 | Nil | Nil | Nil | Nil | Nil | 6m, 70%, Rhizophora | Nil | 1m, 15%, Meriops sp. | Mud | Uneven Age |
| 14 | 12.11.6 | 10 | Mod (1-5yrs) | Nil | Severe (>10yrs) | Light (Current) | Nil | Nil | 16m, 40%, C. citriodora | 10m, 10% Eucs. | 2.5m, 40%, Acacia spp | 0.5m, 20% Grasses | Adv. Regen. |
| 15 | 12.11.6 | 5 | Mod (1-5yrs) | Nil | Severe (>10yrs) | Light (Current) | Nil | Nil | 20m, 25%, C. citriodora. | 14m, 10%, C. citriodora | 2.5m, 50%, Acacia spp | 0.5m, 30% Xanthorheae | Adv. Regen. |
| 16 | 12.3.3 / 12.3.7 | 0 | Light (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Nil | Nil | 18m, 25%, E. tereticornis | 10m, 20%, E. tereticornis | 2m, 15%, Acacia spp | 0.5m, 80% Grasses | Adv. Regen. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 12.3.3 / 12.3.7 | 0 | Light (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 18m, 20%, E. tereticornis | 8m, 20%, E. tereticornis | 2.5m, 30%, Acacia spp | 0.8m, 30% Grasses | Adv. Regen. |
| 18 | 12.11.6 | 10 | Light (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 18m, 40%, E. crebra / C. citriodora | 7m, 10% Euc. Spp. | 2m, 30%, Acacia spp | <0.5m, 20% Grasses | Adv. Regen. |
| 19 | 12.11.6 | 10 | Light (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 20m, 25%, C. citriodora | 8m, 15%, C. citriodora | 2m, 20%, Acacia spp | 0.3m, 15% Grasses | Adv. Regen. |
| 20 | 12.11.6 | 5 | Light (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 16m, 15%, Euc. tereticornis | 6m, 15%, E. tereticornis | <2m, 20%, Acacia spp | <0.2m, 30% Grasses | Adv. Regen. |
| 23 | 12.11.6 / 12.11.14 | 10 | Mod (1-5yrs) | Nil | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 16m, 50%, C. citriodora | 10m, 15%, C. citriodora | 2.5m, 50%, Acacia spp | 0.4m, 50% Grasses | Adv. Regen. |
| 24 | 12.11.6 | 20 | Light (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Light (Current) | Nil | 24m, 30%, C. citriodora | Nil | 3m, 40%, Acacia spp | 0.4m, 40% Grasses | Adv. Regen. |
| 25 | 12.11.6 / 12.11.14 | 5 | Light (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Current | Nil | 18m, 50%, Euc. tereticornis | 6m, 10%, E. tereticornis | 3m, 20%, Acacia spp | 0.5m, 15% Grasses | Adv. Regen. |
| 29 | 12.11.6 / 12.11.14 | 0-3 | Light (1-5yrs) | Nil | Severe (>10yrs) | Light (Current) | Nil | Nil | 23m, 30%, Euc. tereticornis | 12m, 15%, E. tereticornis | 2m, 40%, Acacia spp | 0.5m, 45% Grasses | Uneven Age |
| 30 | 12.11.6 | 5 | Mod (5-10yr) | Nil | Severe (>10yrs) | Light (Current) | Moderate (Current) | Nil | 26m, 60%, C. citriodora | 14m, 40%, C. citriodora | 5m, 60%, Acacia spp | 1m, 80% Grasses | Uneven Age |

Table A5b: Fauna Habitat – Site Characteristics, quadrants, Curtis Island, October 2008 (Continued)

Key: % = percent of trees with feature present in the 1ha plot; m = metres; Logs = greater than 15cm diameter; Ck = creek

| Site No. | Fauna Habitat Features | | | | | | | | | | Proximity to Water | | Features | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mistletoe | Epiphytes | Fleshy Fruits | Flower | Acacia | Banksia | Allocasuarina | Figs | Decorticating Bark | Melaleucas | Perm. Water | Temp. Water | Caves / Rock Fissures | Nest or Roost trees | Fallen Logs | Hollow Logs |
| 1 | 0 | 0 | 0 | 5-25% | <5% | 0 | 0 | 0 | <5% | 0 | 0 | 25m, Ck | 0 | 0 | 5 | 0 |
| 2 | 0 | 0 | 0 | 0 | 5-25% | 0 | 0 | 0 | 5-25% | 0 | 0 | 50m, Ck | 0 | 0 | 5 | 0 |
| 3 | 0 | 0 | 0 | 0 | 5-25% | 0 | 0 | 0 | <5% | 0 | 0 | 20m, Ck | 0 | 0 | 12 | 2 |
| 4 | 0 | <5% | 0 | 0 | 5-25% | 0 | 0 | 0 | 5-25% | 0 | 0 | 250m, Ck | 0 | 0 | 7 | 2 |
| 5 | 0 | 0 | 0 | 0 | 25-50% | 0 | 0 | 0 | <5% | 0 | 0 | on-site, Ck | 0 | 0 | 14 | 3 |
| 6 | 0 | 0 | 0 | 0 | 25-50% | 0 | 0 | 0 | <5% | 0 | 0 | 200m, Ck | 0 | 0 | 2 | 1 |
| 7 | 0 | 0 | 0 | 0 | 25-50% | 0 | 0 | 0 | <5% | 0 | 0 | 50m, Ck | 0 | 0 | 2 | 0 |
| 8 | 0 | 0 | 0 | 0 | 5-25% | 0 | 0 | 0 | 5-25% | 0 | 0 | 10m, creek | 0 | 50m, raptor nest | 4 | 1 |
| 11 | 0 | 0 | 5-25% | <5% | 0 | 0 | 0 | 0 | <5% | 0 | 0 | 200m, Ck | 0 | 0 | 1 | 0 |
| 12 | 0 | 0 | 5 -25% | <5% | 0 | 0 | 0 | 0 | <5% | 0 | 0 | 500m, Ck | 0 | 0 | 6 | 1 |
| 13 | 0 | 0 | <5% | 5-25% | 0 | 0 | 0 | 0 | <5% | 0 | 0 | 800m, Ck | 0 | 0 | 1 | 1 |
| 14 | 0 | 0 | 0 | 0 | 25-50% | 0 | 0 | 0 | <5% | 0 | 0 | 150m, Ck | 0 | small stick nest | 13 | 1 |
| 15 | 0 | 0 | 0 | 0 | 25-50% | 0 | 0 | 0 | <5% | 0 | 0 | 50m, Ck | 0 | 0 | 2 | 0 |
| 16 | 0 | 0 | 0 | 5-25% | <5% | 0 | 0 | 0 | <5% | <5% | 0 | 250m, Ck | 0 | 0 | 18 | 8 |
| 17 | 0 | 0 | 0 | 5-25% | 5-25% | 0 | 0 | 0 | <5% | <5% | 0 | 50m, Ck | 0 | 0 | 19 | 3 |
| 18 | <5% | 0 | 0 | 0 | 5-25% | 0 | 0 | 0 | <5% | 0 | 0 | 80m, Ck | 0 | 0 | 6 | 2 |
| 19 | 0 | 0 | 0 | 0 | 5-25% | 0 | 0 | 0 | <5% | 0 | 0 | 500m, Ck | 0 | 0 | 10 | 2 |
| 20 | 0 | 0 | 0 | 0 | <5% | 0 | 0 | 0 | 5-25% | <5% | 0 | 200m, dam | 0 | 0 | 11 | 3 |
| 23 | 0 | <5% | 0 | 0 | 5-25% | 0 | 0 | 0 | <5% | 0 | 0 | 0 | 0 | 0 | 3 | 1 |
| 24 | 0 | 0 | 0 | 0 | 25-50% | 0 | 0 | 0 | <5% | 0 | 0 | 100m, Ck | 0 | 0 | 10 | 3 |
| 25 | <5% | 0 | 0 | <5% | 5-25% | 0 | 0 | 0 | <5% | <5% | 0 | 50m, Ck | 0 | 0 | 8 | 2 |
| 29 | 0 | 0 | 0 | 0 | 5-25% | 0 | 0 | 0 | 5-25% | 0 | 0 | on-site, Ck | 0 | 0 | 5 | 1 |
| 30 | 0 | <5% | 0 | 0 | 5-25% | 0 | 0 | 0 | <5% | 0 | 0 | 50m, Ck | 0 | 0 | 4 | 1 |

# APPENDIX B

**EPBC Act – Assessment of Significance for Migratory Species**

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

*Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;*

The subject site is situated within a region (i.e. Curtis Coast) that provides important habitat for a large shorebird population (Driscoll 1997). However, the subject site is used for foraging and roosting by very small numbers of shorebirds. The maximum number of migratory shorebirds recorded during the field survey was seven. This equates to 0.44% of shorebirds recorded at a high tide roost at the southeastern end of Curtis Island. Foraging habitat within the subject site is restricted to narrow mudflats along the western edge of the mangroves and claypan which, only provides foraging opportunities for brief periods during spring high tides. Roosting habitat is extensive, however, its value is diminished by the absence of nearby foraging habitat and the abundance of similar habitat nearby.

Based on the above it is concluded that the project would not destroy, modify or isolate important habitat. It is likely that shorebirds would continue to forage along the mangrove fringe once the LNG facility was operational.

*Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;*

The proposed LNG facility is unlikely to result in an invasive species becoming established. Additional shipping would increase the probability of exotic marine fauna entering Gladstone Harbour; however, issues relating to the marine environment are assessed elsewhere.

*Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.*

The proposal would not affect habitat used by a significant proportion of the populations of Bar-tailed Godwit, Eastern Curlew and Whimbrel. Based on the results of the field survey the subject site is used by a very small proportion of the shorebirds that occur in Gladstone Harbour. Even allowing for a 100% increase in the number of shorebirds using the site the proposal would still not affect a significant proportion of the population. Small numbers of shorebirds are likely to forage along the mangrove fringe once the LNG facility is operational.