

## Section 8

### Avian Migratory Species







## 8 Migratory Species (Avian)

### 8.1 Introduction

#### 8.1.1 General Structure of Section

This section documents the results of the detailed profiling and impact assessment work undertaken for the migratory avian species that were assessed in detail because they are known, likely or possibly occur within the Project area based on the results of the review of matters of NES documented in **Section 4.4** of this report.

The data collection efforts to profile these species were designed to address the information required by the Tailored EIS Guidelines.

In general, the Tailored EIS Guidelines require the following information to be provided about the listed species and communities that are considered likely or known to occur in the Project area:

- broader distribution, ecology and habitat preferences of the species on a regional perspective;
- distribution, ecology, habitat preference and potential threats to the species on the Project area;
- information to explain the survey methodology used and its limitations;
- relevant impacts;
- proposed avoidance, mitigation and monitoring measures;
- residual impacts and their significance; and,
- proposed offset measures.

This section is structured to document the results of this assessment and present the information in a logical progression for each species group. The structure of this section is outlined as follows.

- **Section 8.2** provides information on profile, regional distribution and potential threats to the various species groups.
- **Section 8.3** describes the specific survey efforts and the results that lead to a better understanding of Project area habitat preferences.
- **Section 8.4** describes the potential direct and indirect impacts of the Project.
- **Section 8.5** outlines proposed avoidance, mitigation and enhancement measures and residual impacts.
- **Section 8.6** outlines offset measures, where required.

#### 8.1.2 General Approach to Impact Assessment

The Tailored EIS Guidelines require detailed impact assessments for each species identified as either known or likely to occur within the Project area. A conservative approach was taken and species that could possibly occur were also selected for more detailed assessment. **Section 4.4** describes how the likelihood of occurrence was identified. The detailed impact assessment includes a focus on potential impacts on key habitat for each species associated with the construction and operational phases of the Project.

In general, the impact assessment process for each species group focussed on the following key steps:

1. Determine the potential environmental impacts of the Project on each species group;
2. Identify avoidance and mitigation and enhancement measures to avoid and/or mitigate potential adverse environmental impacts; and,

### 3. Determine the significance of the residual impacts.

To document the results of the impact assessment process, the various subsections have been structured to provide an overview of the potential construction and operational impacts on each matter of NES. **Table 8-1** outlines the potential direct and indirect impacts considered during the impact assessment process.

**Table 8-1 Potential Direct and Indirect Impacts Considered**

Direct Impacts	Indirect Impacts
Clearing and loss of habitat	Water quality
Edge effects	Altered hydrological regime
Fragmentation of habitat	Noise
Effects on movement/breeding/feeding patterns	Air quality
Altered light regime	Introduction of weeds and pests
	Altered fire regime

The magnitude of potential impacts (both unmitigated and residual), are rated as either:

- None/negligible - unlikely to be any effect of consequence to the species.
- Minor impact - impact would occur in areas of general habitat. Individuals of the species would be affected and may need to alter utilisation of the impact area but are unlikely to be permanently displaced. Important populations or habitats would not be affected.
- Moderate impact - impact would occur in areas of general habitat. Important habitat may be displaced. Local and important populations may experience some effect.
- High impact - impact would occur in areas of important habitat and important populations permanently affected.

High and moderate residual impacts are considered to be significant, and none/negligible and minor residual impacts are not considered to be significant.

Criteria for assessing the significance of potential impacts on listed migratory species are provided by DEWHA (2009b) which states that:

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

- *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;*
- *result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or,*
- *seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species."*

The concepts of 'important habitat' and 'ecologically significant proportion' are thus key to determining whether a significant impact is likely. Important habitat for a migratory species as described in DEWHA (2009b) is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or,

- b) habitat that is of critical importance to the species at particular life-cycle stages; and/or,
- c) habitat utilised by a migratory species which is at the limit of the species range; and/or,
- d) habitat within an area where the species is declining.

The definition of an ecologically significant proportion of a population refers to whether the portion of a migratory species population potentially affected is especially important for the overall species population with respect to attributes such as genetic variability, contribution to reproductive effort or success, or particular site specific behavioural patterns that may be of significance for the overall population (DEWHA 2009b).

The extent to which areas utilised by migratory avian species within the Project area represent important habitat, and the potential for migratory avian populations within the Project area to comprise ecologically significant proportions of overall populations are addressed in the impact assessment section (refer to **Section 8.4**).

As detailed in **Section 4.5.2.9**, the Protected Matters Search identified 40 listed avian migratory species within the area that would be transited by Project-related shipping. The assessment results summarised in **Appendix 4-A** show that the likelihood of impacts to each identified listed threatened and migratory species from Project-related shipping would be either nil, rare or unlikely. There are no impacts that are either almost certain, likely or possible. Hence, based on the methodology described in **Section 4.3**, there are no relevant impacts on listed threatened and migratory species associated with predicted Project-related shipping activities and detailed impact assessment is not required.

## 8.2 Profiles, Regional Distribution and Potential Threats

The migratory avian species listed under the EPBC Act that were confirmed within the Project area or were determined as likely or possibly occurring within the Project area are summarised in **Table 8-2**. The species comprise:

- species identified in the EPBC Act database search for the Project area that were confirmed or determined as likely or possibly occurring within the Project area;
- additional species recorded during field surveys as part of the environmental impact assessment; and,
- additional species assessed as potential inhabitants of the area based on the array of available habitats mapped during field surveys as part of the environmental impact assessment.

Of the 45 migratory avian species identified as potential inhabitants of the Project area, 40 have been assessed as known, likely or possibly occurring in the Project area and therefore a detailed impact assessment has been completed (refer to **Section 4.4.2.4** for additional details on the likelihood assessment).

Given the large number of migratory avian species to be assessed, they were grouped into the following groups as numerous species share similar characteristics with regards to use, migration patterns and habitat:

- international migratory shorebirds;
- waterbirds;
- seabirds;
- raptors;
- woodland birds;
- Barn Swallow; and,
- aerial species.

**Table 8-2** summarises the migratory avian species included in each group, the potential of each group's occurrence within the Project area, as well as their known habitat.

**Table 8-2 Migratory Avian Species**

<b>Migratory Avian Group</b>	<b>Species</b>	<b>Occurrence within Project Area</b>	<b>Preferred Habitat</b>
International Migratory Shorebirds	<i>Actitis hypoleucos</i> Common Sandpiper	Likely	International migratory shorebirds utilise a variety of habitat types including tidal mudflats and sandflats, inland lakes or waterways and estuaries. A number of internationally significant sites occur across Queensland. The nearest significant site is the south east Gulf of Carpentaria which is approximately 500km south of the Project area.
	<i>Calidris acuminata</i> Sharp-tailed Sandpiper	Possible	
	<i>Calidris canutus</i> Red Knot	Possible	
	<i>Calidris ferruginea</i> Curlew Sandpiper	Possible	
	<i>Calidris ruficollis</i> Red-necked Stint	Possible	
	<i>Calidris tenuirostris</i> Great Knot	Likely	
	<i>Charadrius leschenaultii</i> Greater Sand Plover	Possible	
	<i>Charadrius mongolus</i> Lesser Sand Plover	Confirmed (EIS surveys)	
	<i>Charadrius veredus</i> Oriental Plover	Possible	
	<i>Gallinago hardwickii</i> Latham's Snipe, Japanese Snipe	Likely	
	<i>Heteroscelus brevipes</i> Grey-tailed Tattler	Possible	
	<i>Limnodromus semipalmatus</i> Asian Dowitcher	Possible	
	<i>Limosa lapponica</i> Bar-tailed Godwit	Possible	
	<i>Limosa limosa</i> Black-tailed Godwit	Possible	
	<i>Numenius madagascariensis</i> Eastern Curlew	Confirmed (EIS surveys)	
	<i>Numenius minutus</i> Little Curlew, Little Whimbrel	Possible	
	<i>Numenius phaeopus</i> Whimbrel	Confirmed (EIS surveys)	
	<i>Pluvialis fulva</i> Pacific Golden Plover	Possible	
	<i>Pluvialis squatarola</i> Grey Plover	Possible	
	<i>Tringa nebularia</i> Common Greenshank	Confirmed (EIS surveys)	
	<i>Tringa stagnatilis</i> Marsh Sandpiper	Confirmed (EIS surveys)	
	<i>Xenus cinereus</i> Terek Sandpiper	Possible	
Waterbirds	<i>Acrocephalus stentoreus</i> Clamorous Reed-Warbler	Confirmed (EIS surveys)	Preferred habitats for waterbird species include, but are not limited to, river shallows, estuaries, tidal mudflats, freshwater wetlands and large dams.
	<i>Ardea alba</i> Great Egret, White Egret	Confirmed (EIS surveys)	
	<i>Egretta sacra</i> Eastern Reef Egret	Confirmed (EIS surveys)	
	<i>Grus Antigone</i> Sarus Crane	Likely	

Migratory Avian Group	Species	Occurrence within Project Area	Preferred Habitat
	<i>Plegadis falcinellus</i> Glossy Ibis	Confirmed (EIS surveys)	
Seabirds	<i>Fregata minor</i> Great Frigatebird	Confirmed (EIS surveys)	Seabirds utilise coastal waters and open ocean for feeding. Seabird species are known to breed in colonies on beaches and offshore islands.
	<i>Fregata ariel</i> Lesser Frigatebird	Confirmed (EIS surveys)	
	<i>Sterna albifrons</i> Little Tern	Confirmed (EIS surveys)	
Raptors	<i>Haliaeetus leucogaster</i> White-bellied Sea-eagle <i>Pandion cristatus</i> Eastern Osprey	Confirmed (EIS surveys)	The Eastern Osprey and White-bellied Sea-eagle are wide ranging bird species which occupy marine and terrestrial habitats. Preferred habitat for the Eastern Osprey includes coasts, estuaries, bays and inlets. The White-bellied Sea-eagle utilises the same habitats as the Eastern Osprey as well as large rivers and inland lakes. Both species nest in tall trees within 1km of water.
Woodland Birds	<i>Cuculus saturatus</i> Oriental Cuckoo	Likely	Both the Rainbow Bee-eater and Oriental Cuckoo are known to occur within a variety of timbered and more open habitats including woodlands and forest, riparian zones, parks and gardens, and the complex of open and timbered habitats in coastal areas, including beaches.
	<i>Merops ornatus</i> Rainbow Bee-eater	Confirmed (EIS surveys)	
	<i>Myiagra cyanoleuca</i> Satin Flycatcher	Confirmed (EIS surveys)	The Satin Flycatcher, Rufous Fantail and Black-faced Monarch are known to occupy forest and woodland habitats usually where there is deep shade and complex vegetation structure. Favoured habitats include rainforest riparian gallery forest, vine forest, Melaleuca forest and mangroves.
	<i>Rhipidura rufifrons</i> Rufous Fantail	Confirmed (EIS surveys)	
	<i>Monarcha melanopsis</i> Black-faced Monarch	Possible	
Barn Swallow	<i>Hirundo rustica</i> Barn Swallow	Possible	The Barn Swallow is often recorded in open country, near water, towns and cities (DSEWPac 2012q). Habitats in which this species is known to occur include freshwater wetlands and paperbark woodland.
Aerial Species	<i>Apus pacificus</i> Fork-tailed Swift <i>Hirundapus caudacutus</i> White-throated Needletail	Confirmed (EIS surveys)	Aerial species spend day and night on the wing and occupy airspace above most habitat types.

The following subsections provide profiles of each of these groups.

## 8.2.1 International Migratory Shorebirds

Avian species considered 'shorebirds' may occur across a number of habitat types but are primarily associated with wetlands and coastal areas. Species considered international migratory shorebirds are those listed under the Birds Australia migratory shorebirds species list (Birds Australia 2009) which undertake annual migration between the northern and southern hemisphere.



As part of this annual migration, international migratory shorebirds arrive in Australia each spring and disperse throughout the continent to feeding grounds amongst coastal and inland wetland habitats. The Project area is situated within the East Asian-Australasian Flyway (refer **Figure 8-1**) for trans-equatorial migratory waders which is an area encompassing eastern Asia and Australasia which hosts the primary movement pathways for the majority of migratory shorebirds visiting Australia (Bamford *et al.* 2008). The Gulf of Carpentaria is regarded as one of the main access pathways for these species into Australia.

Within the Gulf of Carpentaria, the southeast Gulf is recognised as a key site for international migratory shorebirds with extensive wet season wetland habitats and tidal flats providing productive feeding grounds (Driscoll 2001). It is anticipated that the majority of individuals that utilise the southeast Gulf areas access these areas directly, rather than work their way down the west coast of Cape York Peninsula (including the area covered by the Project). The Weipa Plateau sub-region is not regarded as a particularly significant feeding ground for these birds although small numbers can be observed along the coastline and within associated estuarine habitats.

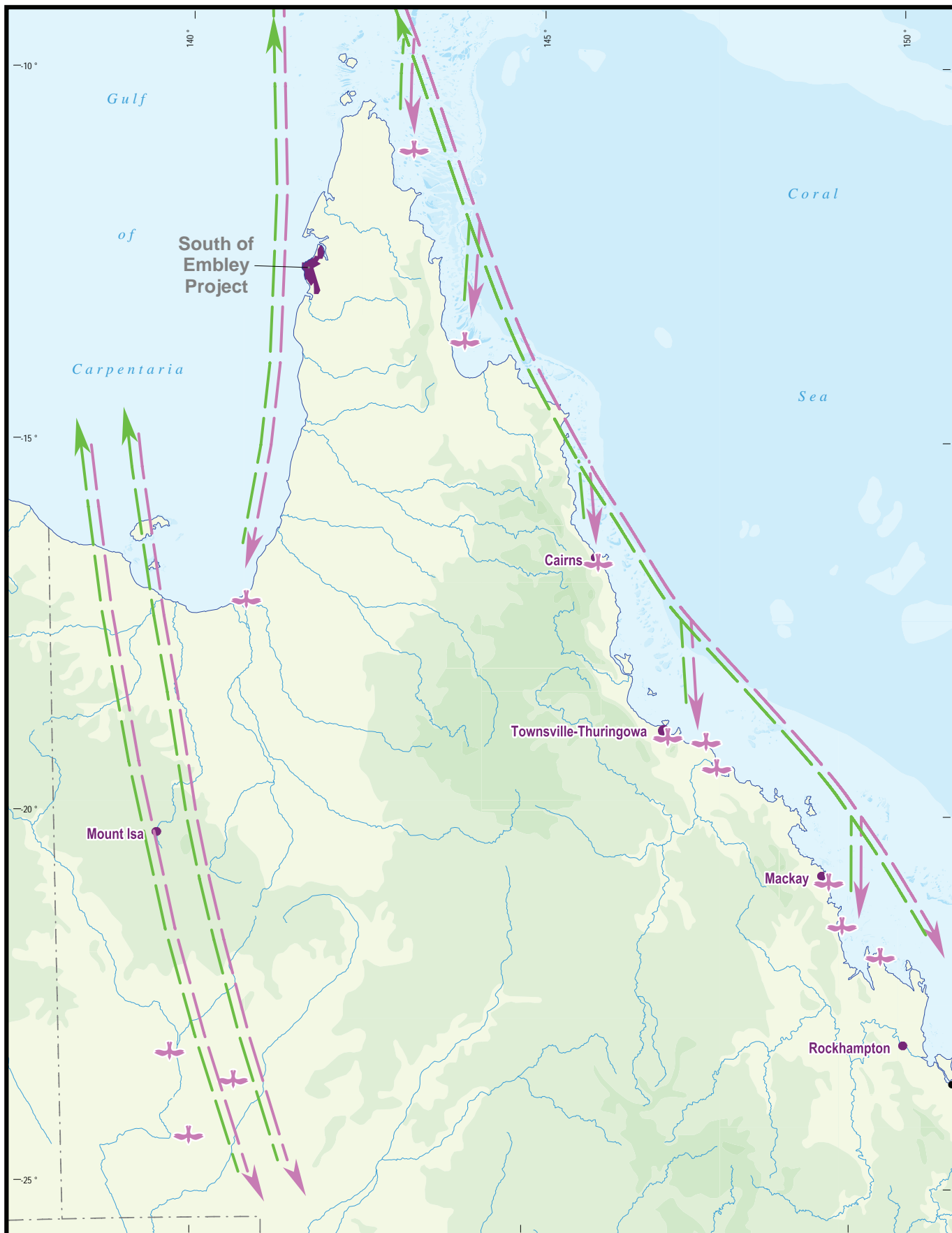
The number of birds utilising habitats within the sub-region is not known but based on reporting rates of species on Cape York Peninsula and in the Gulf of Carpentaria from annual surveys (Barrett *et al.* 2003) the sub-regional population is apparently a very small component of the overall number of individuals that have been recorded in the southeast Gulf sites and that utilise the East Asian-Australasian Flyway.

Birds are most commonly present in Australia from October to March and the return migration occurs from March to early June, although some non-breeding individuals may remain throughout the year (DEWHA 2009a), particularly in the southern Gulf.

DSEWPac (2012g) list the following known threats to migratory shorebird species:

- clearing, inundation, infilling or draining of habitat;
- changes in hydrology, water quality or structural changes near roosting sites causing an indirect loss or degradation of habitat;
- habitat degradation due to loss of marine or estuarine vegetation, weed invasion of intertidal mudflats, water pollution and changes to the water regime, changes to hydrological regimes leading to the exposure of acid sulphate soils;
- disturbance of migratory shorebirds during foraging as a result of residential and recreational activities; and,
- direct mortality as a result of interferences in the flyways or degradation of important sites across flyways. These may include but are not limited to the development of wind farms in migration pathways, bird strike by aeroplanes and oil and chemical spills.

The above threats occur mainly as a result of population growth and economic development, especially in east and southeast Asia.



Rio Tinto Alcan

- Project Area
- Locality
- River

#### International Migratory Shorebirds

- Significant Shorebird Sites
- Summer Migration (Spring Arrival)
- Winter Migration (Autumn Departure)

South of Embley Project

**Fig. 8-1: Notional Migratory Pathways for Shorebirds**



150 0 150km

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012

### 8.2.2 Waterbirds

Bird species considered waterbirds are those which may inhabit a variety of wetland habitats across both terrestrial and coastal ecosystems. These species are not listed on the Birds Australia shorebirds species list.

Five waterbird species listed under the EPBC Act were identified as known or likely to occur or possibly occurring within the Project area (refer **Table 8-2**). All of these species are commonly encountered within the Weipa Plateau sub-region, although the population of each species within the sub-region and wider Cape York area has not been determined. All five waterbird species are known to utilise a variety of natural and man-made habitats but primarily use the extensive estuarine and freshwater habitats that occur within the sub-region along the Western Cape York coastline (Morcombe 2004, Pizzey and Knight 2007).

Migratory patterns of waterbirds in the Cape York Peninsula bioregion are not well documented but in the primarily freshwater species comprising Clamorous Reed-Warbler, Great Egret, Sarus Crane and Glossy Ibis are most likely associated with the seasonal availability of wetland habitats. Specifically, as wetland habitats filled by wet season rains dry up, foraging opportunities diminish and birds move to alternative wetland habitat. It is likely that by the end of the dry season most of these species have moved to the most persistent wetland habitats that provide refugial foraging areas until wet season rains re-commence. It is unclear whether any such refugial areas occur within the sub-region and therefore a figure depicting regional migratory patterns was unable to be produced. There are no such refugial areas in the Project area.

The Clamorous Reed-Warbler is confined to dense grass and reed vegetation at the periphery of freshwater wetlands whilst the Eastern Reef Egret inhabits coastal habitats particularly rocky points, reefs and beaches (Pizzey and Knight 2007).

The Great Egret, Eastern Reef Egret and Glossy Ibis are colonial nesting species (Pizzey and Knight 2007) that may also undertake seasonal movements to and from nesting colonies. The location of any such colonies within the sub-region is not documented.

Threats to migratory waterbird species are associated with physical disturbance of preferred habitats, and effects on the ecological integrity of habitats that may result from development related factors such as changes to water quality, and altered groundwater and surface water regimes. Clearing of habitat or urbanisation of habitat is not regarded as a current threat in the sub-region or wider Cape York region, and no habitat for waterbirds would be cleared within the Project area.

### 8.2.3 Seabirds

Seabirds are those birds which frequent the coastal waters and the open ocean. Seabirds are known to disperse long distances across the open ocean and breed in colonies on offshore islands.

Four migratory seabird species were identified as likely to occur within the sub-region with three of these subsequently identified within the Project area during field surveys namely; the Little Tern (*Sternula albifrons*), Great Frigatebird (*Fregata minor*) and Lesser Frigatebird (*Fregata ariel*). The Streaked Shearwater (*Calonectris leucomelas*) was provisionally identified during the literature review; however, this species utilises open ocean habitat and is considered unlikely to occur within the area which would be impacted by the Project.

The Little Tern has three distinct sub-populations including a south-eastern, northern and non-breeding Asian population. These populations exhibit full migration (south-eastern), partial migration (Asian) or no migration (northern).

Within the Weipa Plateau sub-region there are records (Barrett *et al.* 2003) of the Little Tern from all seasons apart from spring, although it is expected that the Little Tern would occur all year round with numbers increasing during the spring / summer months when the non-breeding Asian population migrates south to Australian shores. Also during this period, the south-eastern population departs the Project area for their southern breeding grounds (Pizzey and Knight 2007). An indication of migration pathways for the Little Tern is provided in **Figure 8-2**.

The Little Tern is regularly recorded in low numbers at foreshores, estuaries and coastal margins around Weipa. An important breeding colony for the northern population of the Little Tern is located north of the Pennefather River mouth (approximately 50km north of the Project area), indicating that the coastline north of the Project area is important for this species (Abrahams *et al.* 1995). The location of this is shown in **Figure 8-3**. The population of the species within the sub-region has not been determined but is likely to vary seasonally as the three sub-populations interact.

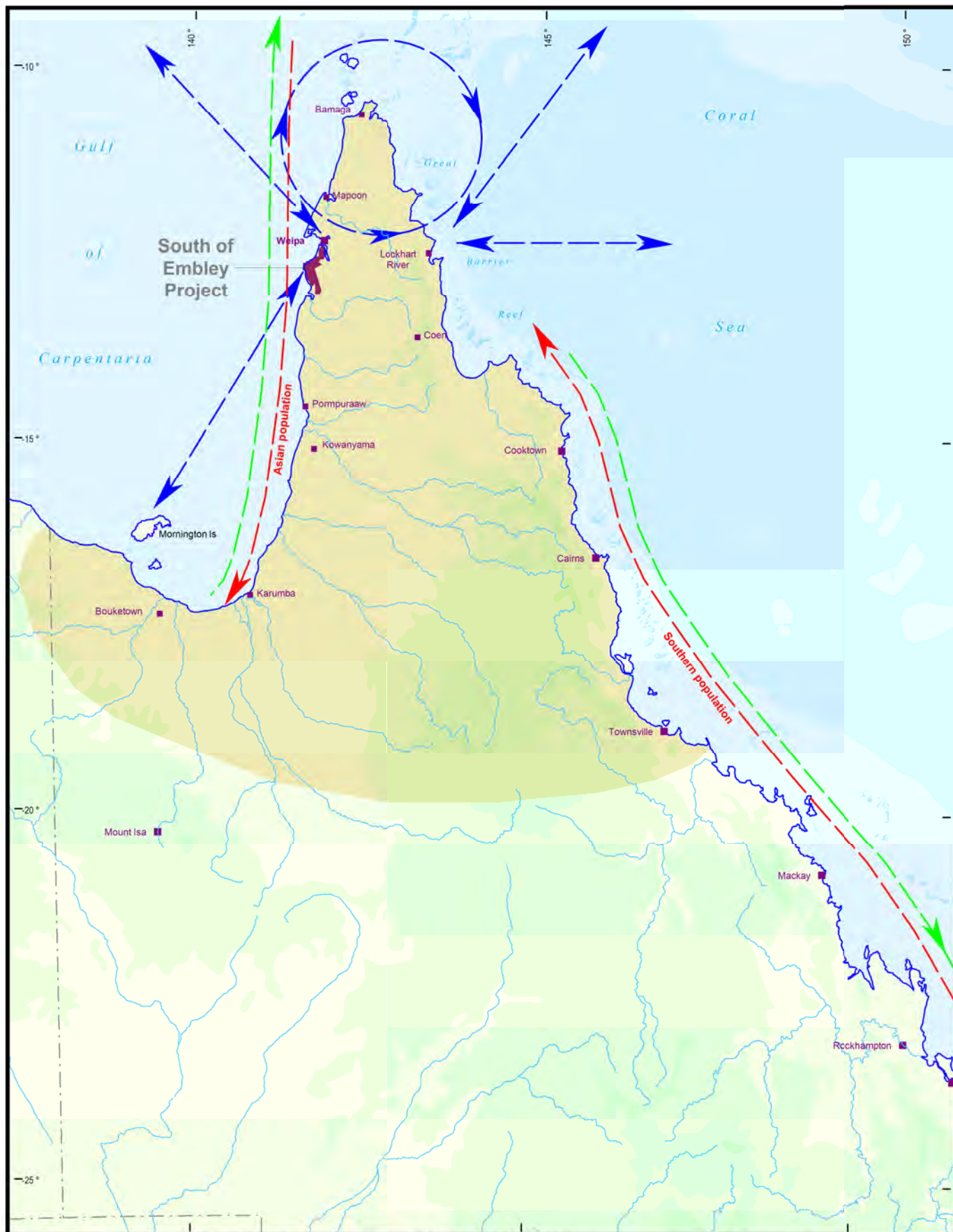
The primary threats to the Little Tern potentially occur at nesting sites along beaches where vehicle and human disturbance can directly destroy nests or adversely affect breeding activity, and feral animals can prey on eggs and young. The large numbers of feral pigs in the sub-region represent a significant predator threat to the species. Away from breeding areas, threats include (Garnett and Crowley 2000):

- deterioration of water quality in estuaries;
- pesticide residues in fish; and,
- oil fouling of individuals and beach habitat.

The pressure analysis conducted in The Species Group Report Card – Seabirds: Supporting the Marine Bioregional Plan for the North Marine Region (DSEWPac 2012p) does not identify and pressures of concern for the Little Tern. DSEWPac (2012p) identifies the following pressures of potential concern for the Little Tern.

- sea level rise (climate change);
- changes in sea temperature (climate change);
- changes in oceanography (climate change);
- ocean acidification (climate change);
- marine debris (land based activities, fishing boats, shipping and other vessels);
- human presence at sensitive sites (tourism, recreational and charter fishing and research); and,
- invasive species (land based activities).

The National Conservation Values Atlas (DSEWPac 2012i) identifies the over-water areas off the Project area as a biologically important foraging area for the Lesser Frigatebird (refer **Figure 8-3**). The Great Frigatebird and Lesser Frigatebird are well represented in the Weipa Plateau sub-region with the only known mainland roosts of the species located near Weipa to the north of the Project area (refer **Figure 8-3**). The Weipa roosts are centred on two main locations, on the eastern edge of town northwest of Humbug Wharf, and adjacent the East Weipa mine area and Weipa Airport. Available information indicates that the two Weipa roost sites support a large number of Frigatebirds (1,000 to 3,000 individuals at any one time), comprising both Lesser and Great Frigatebirds. Around Weipa, both Lesser and Great Frigatebirds are typically seen high above land's edge, soaring on thermals or offshore breezes in the mid to late afternoon. Both species feed offshore during the day, and appear to come inshore in the afternoon to make use of thermals rising from the heated land surface. Individuals may travel extensive distances during daily foraging. There are no recorded breeding locations for Frigatebirds within the sub-region with the closest known breeding colonies located in the southern Gulf of Carpentaria and on northern GBR islands.



Rio Tinto Alcan

- Project Area
- Locality
- River

**Great (*Fregata minor*) and Lesser (*Fregata ariel*) Frigatebirds**

- Foraging and Breeding Migration \*
- Little Tern (*Sternula albifrons*) Asian and Southern Populations**
- Summer Migration (Spring/Summer Arrival)
- Winter Migration (Autumn/Winter Departure)
- Indicative Occurrence (Northern Population)

\* Closest breeding colonies to the Project area are within southern Gulf of Carpentaria and northern Great Barrier Reef Islands. Breeding occurs May to December and breeding individuals are sedentary during this period.

**South of Embley Project**

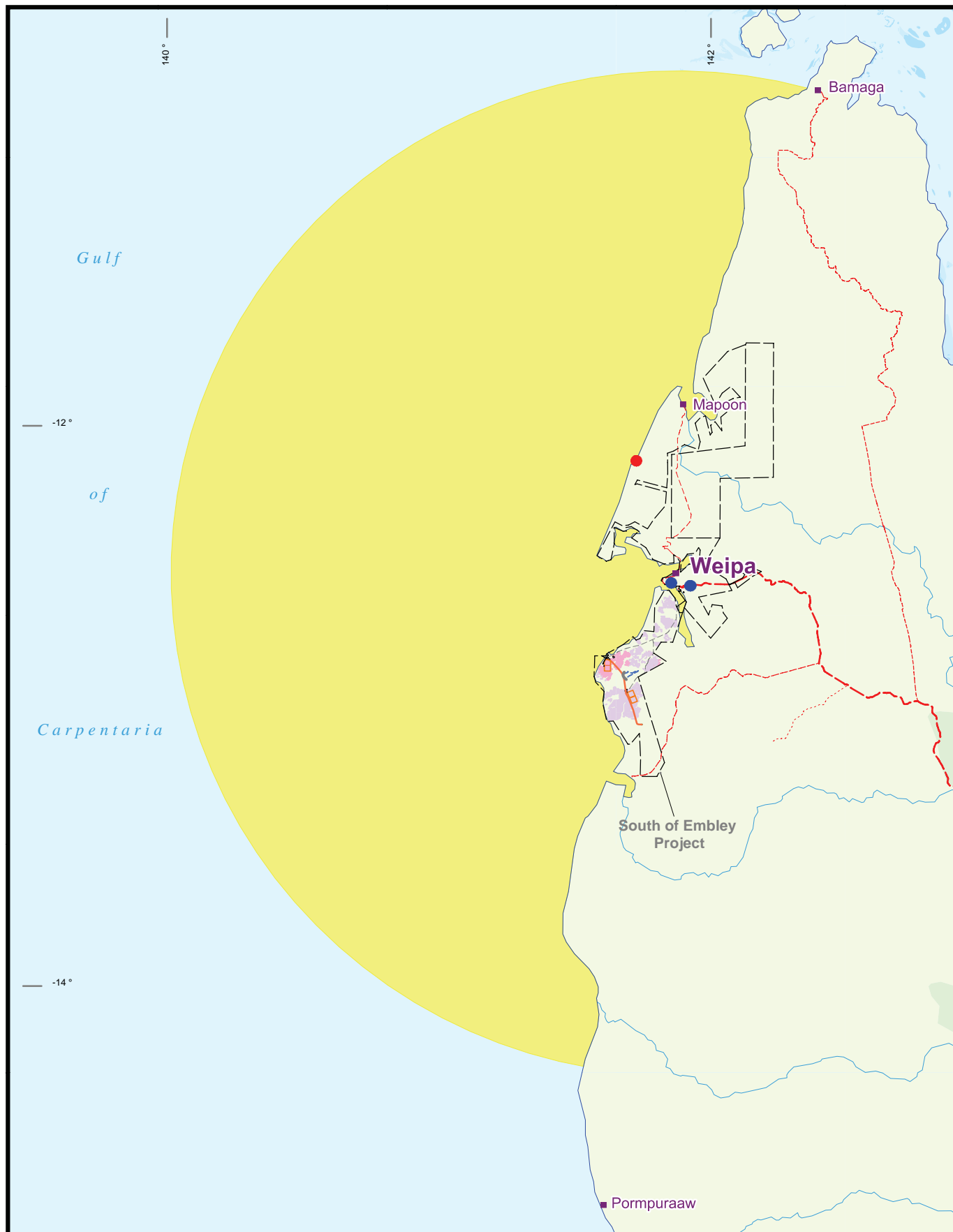
**Fig. 8-2: Notional Migratory Pathways for Seabirds**



150 0 150km

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012





Rio Tinto Alcan

- RTA Mining Lease boundary
- Locality
- River
- - - Freshwater dam
- Tailings storage facility
- Mining Years 1 - 13
- Mining Years 14 - 40

#### Important Habitats

**Great and Lesser Frigatebird**  
 ● Roosts in Weipa area  
 (Identified through field observation)

**Lesser Frigatebird**  
 ■ Foraging Area  
 (Source: DSEWPaC 2012h)

**Little Tern**  
 ● Breeding Colony  
 (Described in relation to local geographic features.  
 Source: Abrahams *et al.* 1995)

Note: Only important habitats in the vicinity of the Project area are shown.

South of Embley Project

**Fig. 8-3: Migratory Seabirds Important Habitats**



0 50 100km

Datum/Projection: GDA94/MGA Zone 54 Date: 15/10/2012

Survey effort for the Great Frigatebird and Lesser Frigatebird included extensive foot traverses and coastal surveys undertaken during targeted surveys for threatened species, as well as a comprehensive fauna survey taken over 48 nights which involved traversing hundreds of kilometres of the Project area. No roosts were observed within the Project area.

Migratory patterns for Frigatebirds utilising the Weipa roosts and indeed for the wider Queensland population are largely unknown; however, being seabirds, Frigatebirds are able to disperse and forage over large distances with little energy expenditure. Weipa Frigatebirds are known to forage through the Gulf of Carpentaria and are likely to also undertake extensive foraging movements and migration to more distant nesting locations within the Gulf of Carpentaria and the GBR. While the species are most often observed flying over the sea, it is possible that Frigatebirds may also disperse over land to forage on the east coast of Cape York Peninsula. **Figure 8-2** depicts the possible migratory pathways utilised by the Great and Lesser Frigatebird. Nesting Frigatebirds are subject to a number of threats however these are not relevant within the sub-region as nesting does not take place in this area. Threats to the mainland roosts include clearing of roost habitat, weed infestation that reduces long term recruitment of canopy trees, and frequent hot fires that may also affect recruitment of potential roost trees. Based on observations of roosting Frigatebirds at Weipa, individuals do not appear particularly sensitive to noise, movement or light emissions when roosting with favoured roost trees located adjacent to roads.

Within foraging areas, threats to the species comprise any processes that lead to the deterioration of food items such as small fish and squid.

The pressure analysis conducted in The Species Group Report Card – Seabirds: Supporting the Marine Bioregional Plan for the North Marine Region (DSEWPac 2012p) does not identify and pressures of concern for the Lesser Frigatebird. DSEWPac (2012p) identifies the following pressures of potential concern for the Lesser Frigatebird.

- sea level rise (climate change);
- changes in sea temperature (climate change);
- changes in oceanography (climate change);
- ocean acidification (climate change);
- marine debris (land based activities, fishing boats, shipping and other vessels);
- human presence at sensitive sites (tourism, recreational and charter fishing and research); and,
- invasive species (land based activities).

#### 8.2.4 Raptors

Raptor bird species are those considered as 'birds of prey' in the Field Guide to Australian Birds (Morecombe 2004).

Two migratory seabird species, the White-bellied Sea-eagle (*Pandion cristatus*) and Eastern Osprey (*Pandion haliaetus*), were identified during database searches as likely to occur within the sub-region and both were observed within the Project area during field surveys.

These species are known to primarily utilise a range of coastal, wetland and riparian habitat types and may also occur some distance into adjoining woodland habitats; although these are not extensively used for foraging or breeding, with nests typically located close to the coast or permanent freshwater. Both species are common in suitable coastal habitat throughout the sub-region although the overall population has not been determined.

The White-bellied Sea-eagle is considered a breeding resident throughout its range in Australia (DSEWPac 2012q). Whilst breeding adult pairs are generally sedentary, juveniles and some adult birds would undertake long distance dispersal (DSEWPac 2012q). Similarly, the Eastern Osprey is mostly resident or sedentary around breeding territories, but will forage widely and may disperse over large

areas during non-breeding periods (DSEWPaC 2012q). As clearly defined movement patterns (e.g. north-south breeding migration) are not known for these species, a figure depicting migratory patterns was unable to be produced.

Whilst these species are not considered to be at threat in the sub-region, nest disturbance and habitat loss are the primary threats to both raptor species within Queensland (DSEWPaC 2012q).

### 8.2.5 Woodland Birds

Woodland bird species are associated with a variety of terrestrial habitats including *Eucalypt* woodlands, vine thickets and riparian gallery communities. These species tend to seasonally migrate throughout the country or region, and/or are locally nomadic. Five migratory woodland bird species were confirmed as present in the Project area, or identified as either likely or possibly occurring. This group was divided into two sub-groups on the basis of similar habitat preferences, comprising:

- Rainbow Bee-eater and Oriental Cuckoo; and,
- Satin Flycatcher, Rufous Fantail and Black-faced Monarch.

#### 8.2.5.1 Rainbow Bee-eater/Oriental Cuckoo

The Rainbow Bee-eater (*Merops ornatus*) and the Oriental Cuckoo (*Cuculus saturatus*) are both known to occur within the sub-region and may be found in a wide variety of habitat types. The Rainbow Bee-eater is particularly abundant in open habitats or along the edge of dense habitat types such as riparian gallery forest, and the complex of open and timbered habitats in coastal areas, including beaches. The Oriental Cuckoo is typically less numerous in occurrence but may be found in a variety of habitats including natural forests and woodlands and more open areas, including parks and gardens. Both species have the potential to occupy all habitats within the Project area. The Rainbow Bee-eater was observed during field surveys at numerous locations and in a variety of habitats. The species was most abundant in riparian, wetland and beach habitats but was also present in Darwin Stringybark woodland. The Rainbow Bee-eater is likely to occur in areas to be disturbed by construction and mining but is also widespread and common in areas that would not be disturbed. The Oriental Cuckoo was not observed during field surveys but it is considered likely to occur.

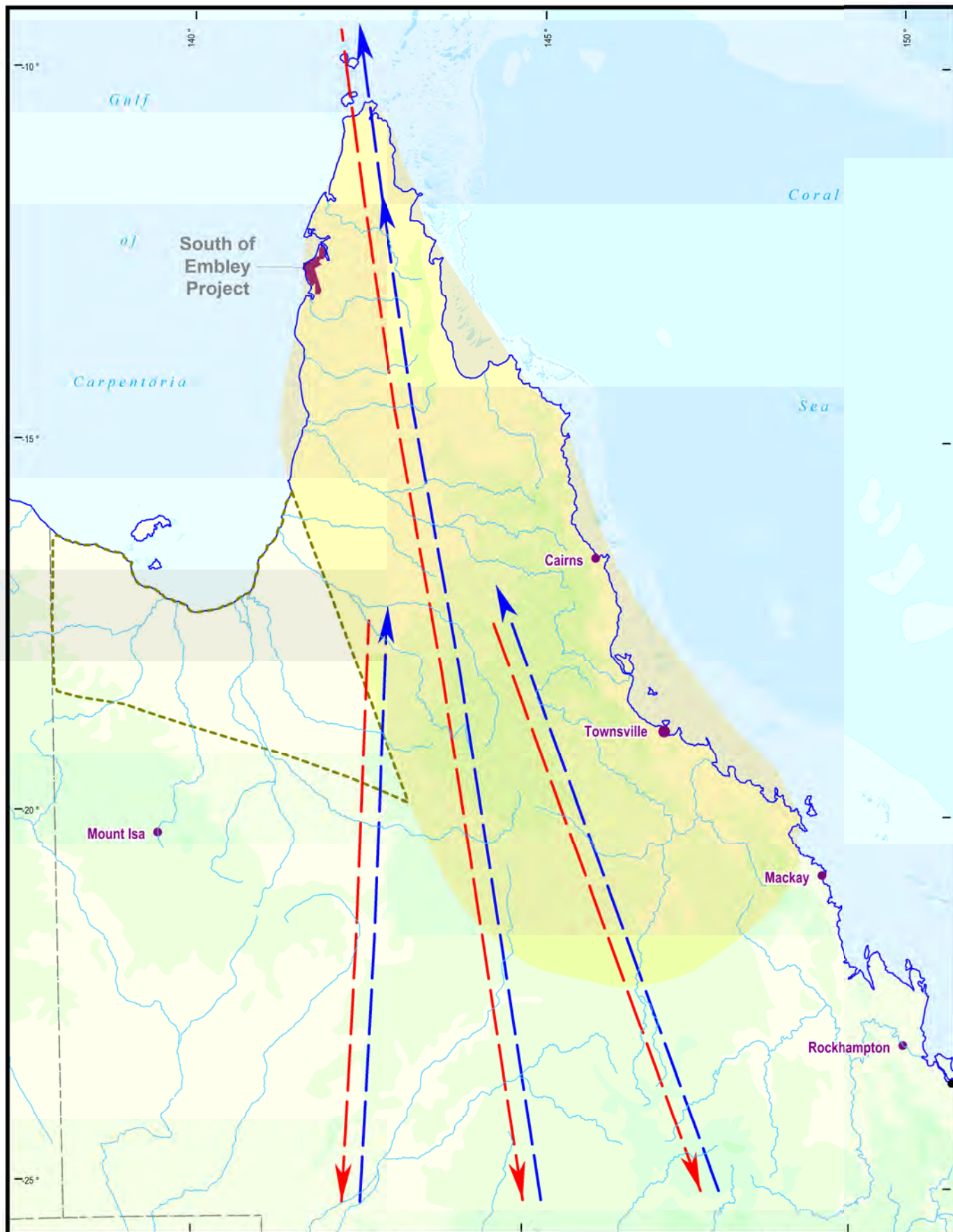
Migratory patterns of the Rainbow Bee-eater are complex with northern populations of the species considered resident (DSEWPaC 2012q).

However, southern populations will migrate north into northern Queensland, Papua New Guinea and eastern Indonesia (DSEWPaC 2012q) during winter months. Based on this, it is considered that the Rainbow Bee-eater will occur within the sub-region all year round, with greater abundances occurring during the March to October months. The Oriental Cuckoo visits Australia during the period September to May (Pizzey and Knight 2007). During the winter months this species returns to breeding grounds in Mongolia, China and Japan via Indonesia and Papua New Guinea. The migratory patterns of these species are notionally depicted in **Figure 8-4** and **Figure 8-5**.

Loss of preferred natural habitat represents the main threat to these species although the Rainbow Bee-eater may also be common in disturbed areas provided that insect prey is available.

### 8.2.6 Satin Flycatcher/Rufous Fantail/Black-faced Monarch

The Satin Flycatcher (*Myiagra cyanoleuca*) and the Rufous Fantail (*Rhipidura rufifrons*) have been recorded from the sub-region and are commonly observed in the Weipa area. The Rufous Fantail was observed within the Project area during field surveys and the Satin Flycatcher is confirmed to occur in the Project area. Both species occupy forest and woodland habitats usually where there is deep shade and complex vegetation structure. Favoured habitats include riparian gallery forest, vine forest, *Melaleuca* forest and mangroves.



RioTinto Alcan

- Project Area
- Locality
- River

#### Woodland Birds

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

- Southern populations (migratory)
  - Winter Migration (Autumn Arrival)
  - Summer Migration (Spring Departure)
- Northern populations (resident)
  - Indicative Known Occurrence
  - Indicative Potential Occurrence

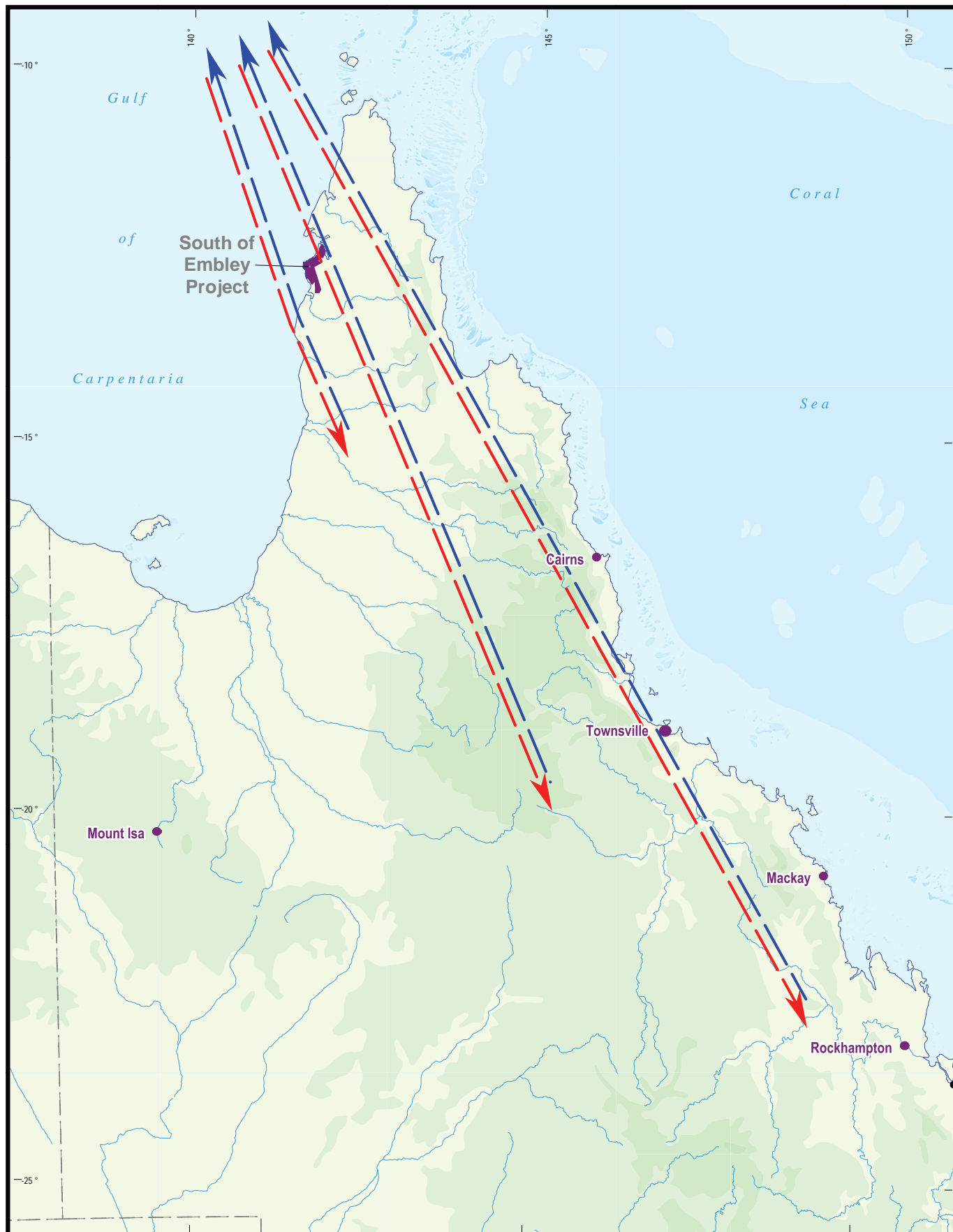
South of Embley Project

**Fig. 8-4: Notional Migratory Pathways for the Rainbow Bee-eater**



150 0 150km

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012



- Project Area
- Locality
- River

### Woodland Birds

#### **Oriental Cuckoo (*Cuculus saturates*)**

- Winter Migration (Autumn Departure)
- Summer Migration (Spring Arrival)

South of Embley Project

**Fig. 8-5: Notional Migratory Pathways for the Oriental Cuckoo**



150 0 150km

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012



The Satin Flycatcher is known to migrate north during the autumn months to winter in northern Australia and Papua New Guinea with individuals returning to southern breeding grounds in spring, to breed during the summer months. The lack of records of the Satin Flycatcher within the Project area may be related to the timing of the winter migration of the species occurring outside of the main survey events. Similarly, the Rufous Fantail migrates north to northern Queensland and regions of Papua New Guinea during the winter months. The migratory patterns of these species are notionally depicted in **Figure 8-6**.

The Black-faced Monarch (*Monarcha melanopsis*) is also closely associated with dense and complex woodland and forest habitats along the east coast of Australia from Cape York to Port Phillip Bay. Many northern individuals migrate to breed in southern parts of the range during summer (August to April) with many individuals also migrating to Papua New Guinea for the autumn-winter period (Pizzey and Knight 2007). The species has been recorded from the Weipa area but is not recorded from the west coast of Cape York south of Weipa. The species could possibly occur in the Project area in association with relatively dense, moist habitats including riparian gallery forest, vine forest, *Melaleuca* forest and mangroves. The migratory patterns of this species are notionally depicted in **Figure 8-7**.

While these species are currently secure, cumulative loss of habitat may threaten these species in the future.

### 8.2.7 Barn Swallow

The Barn Swallow (*Hirundo rustica*) was placed into its own group due to habitat and behavioural preferences being distinct from the other groups.

The Barn Swallow was identified during literature reviews as a likely inhabitant of the sub-region but was not observed during field surveys of the Project area. The Barn Swallow is widespread in the northern hemisphere and non-breeding individuals may migrate south to northern Australia during the summer months (September to March) (Pizzey and Knight 2007) during which time it may be present within the Project area. An indication of migratory movements is provided in **Figure 8-8**. The species is typically associated with open, often disturbed areas close to the coast such as agricultural land and towns but may also utilise natural open habitat types and timbered habitats.

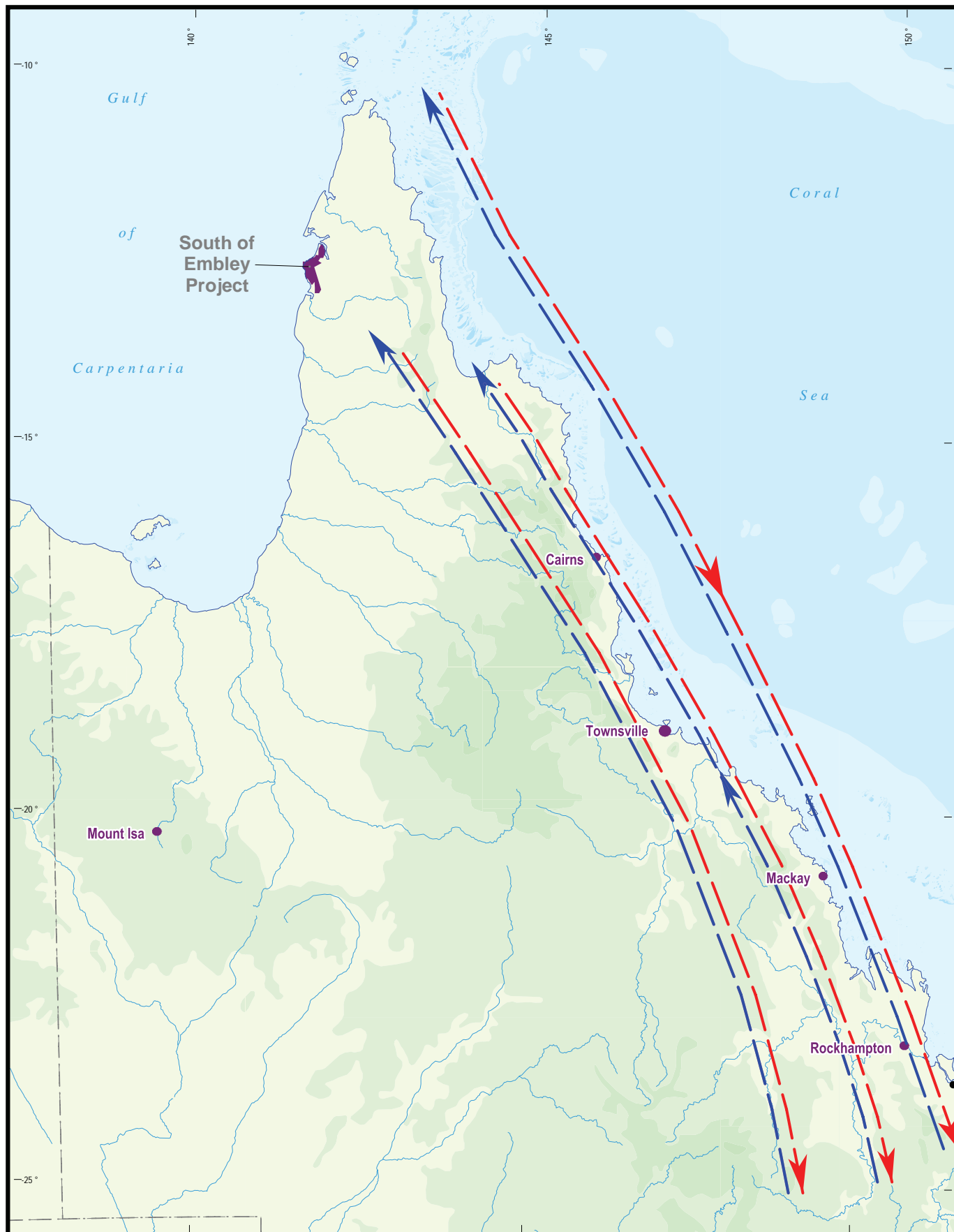
There are no specific threats to this species in Australia.

### 8.2.8 Aerial Species

Aerial bird species are those which stay on the wing day and night. These species seasonally migrate from the northern hemisphere and are known to forage in the airspace over a variety of habitats being dependent on prey occurring in the airspace rather than the underlying habitat type.

The White-Throated Needletail (*Hirundapus caudacutus*) and Fork-Tailed Swift (*Apus pacificus*) were confirmed in the Project area during field surveys. Both species are non-breeding migrants to Australia and are exclusively aerial, spending day and night on the wing. These species fly above a wide range of habitats and are expected to use the airspace across the Project area. Both aerial species migrate to Australia from breeding grounds in Siberia, arriving around October and leaving again by mid-March. **Figure 8-9** details the migration pathway of these species within Australia during this period.

Within Australia there are no recognised significant threats to these species (DSEWPac 2012q).

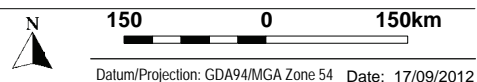


- Project Area
- Locality
- River

**Woodland Birds**  
**Rufous Fantail (*Rhipidura rufifrons*)**  
**Satin Flycatcher (*Myiagra cyanoleuca*)**  
— Winter Migration (Autum/Winter Arrival)  
— Summer Migration (Spring/Summer Departure)

**South of Embley Project**

**Fig. 8-6: Notional Migratory Pathways for the Rufous Fantail and Satin Flycatcher**





RioTinto Alcan

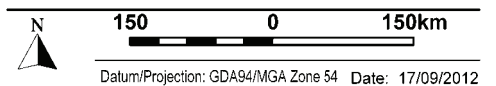
- Project Area
- Locality
- River

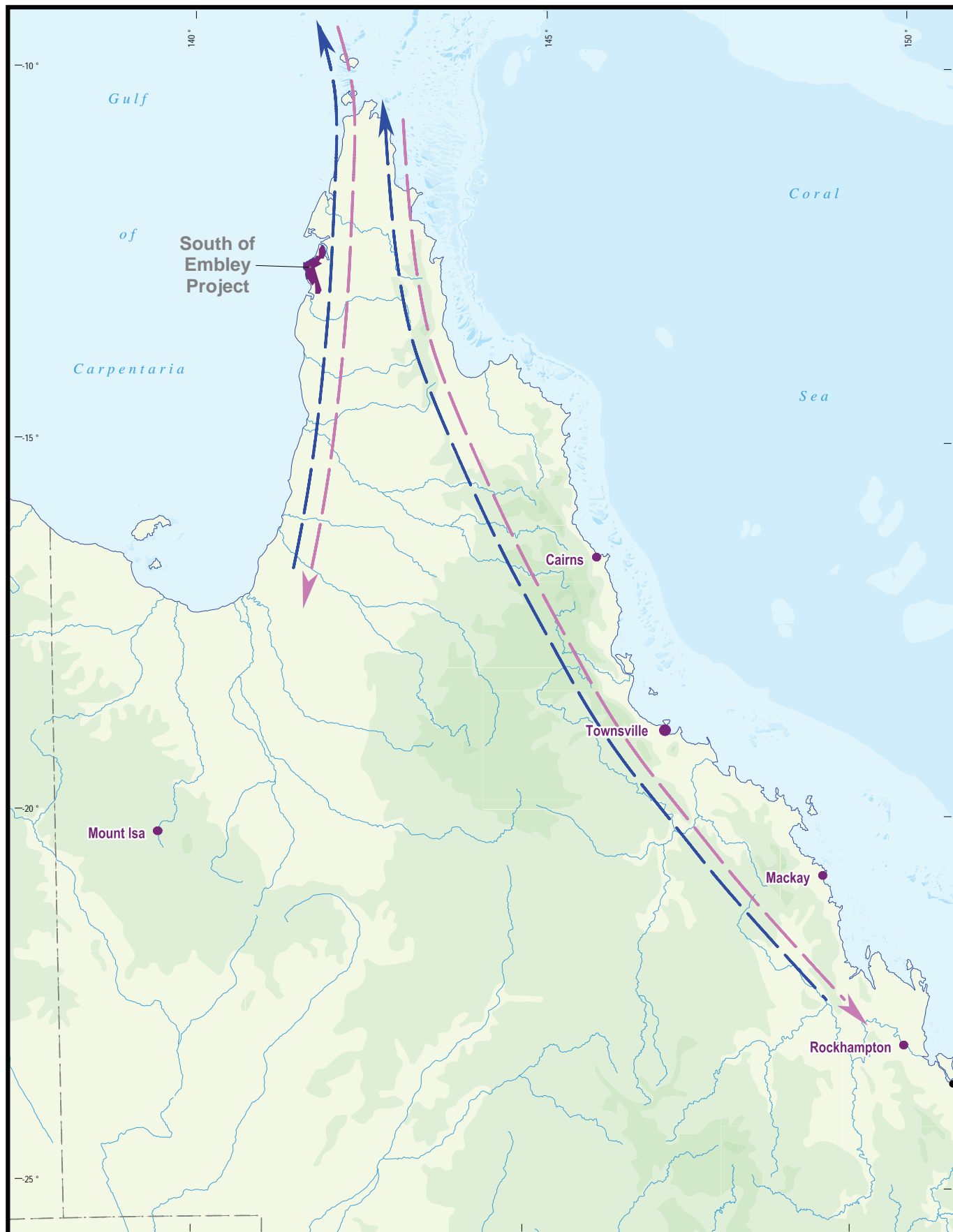
#### Woodland Birds

- Black-faced Monarch (*Monarcha melanopsis*)**
- Indicative Occurrence
  - Partial Population Winter Migration (Autumn/Winter Departure)
  - Partial Population Summer Migration (Spring/Summer Arrival)
  - Partial Population Winter Migration (Autumn Arrival)
  - Partial Population Summer Migration (Spring Departure)

#### South of Embley Project

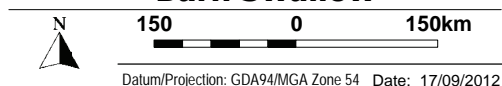
**Fig. 8-7: Notional Migratory Pathways for the Black-faced Monarch**

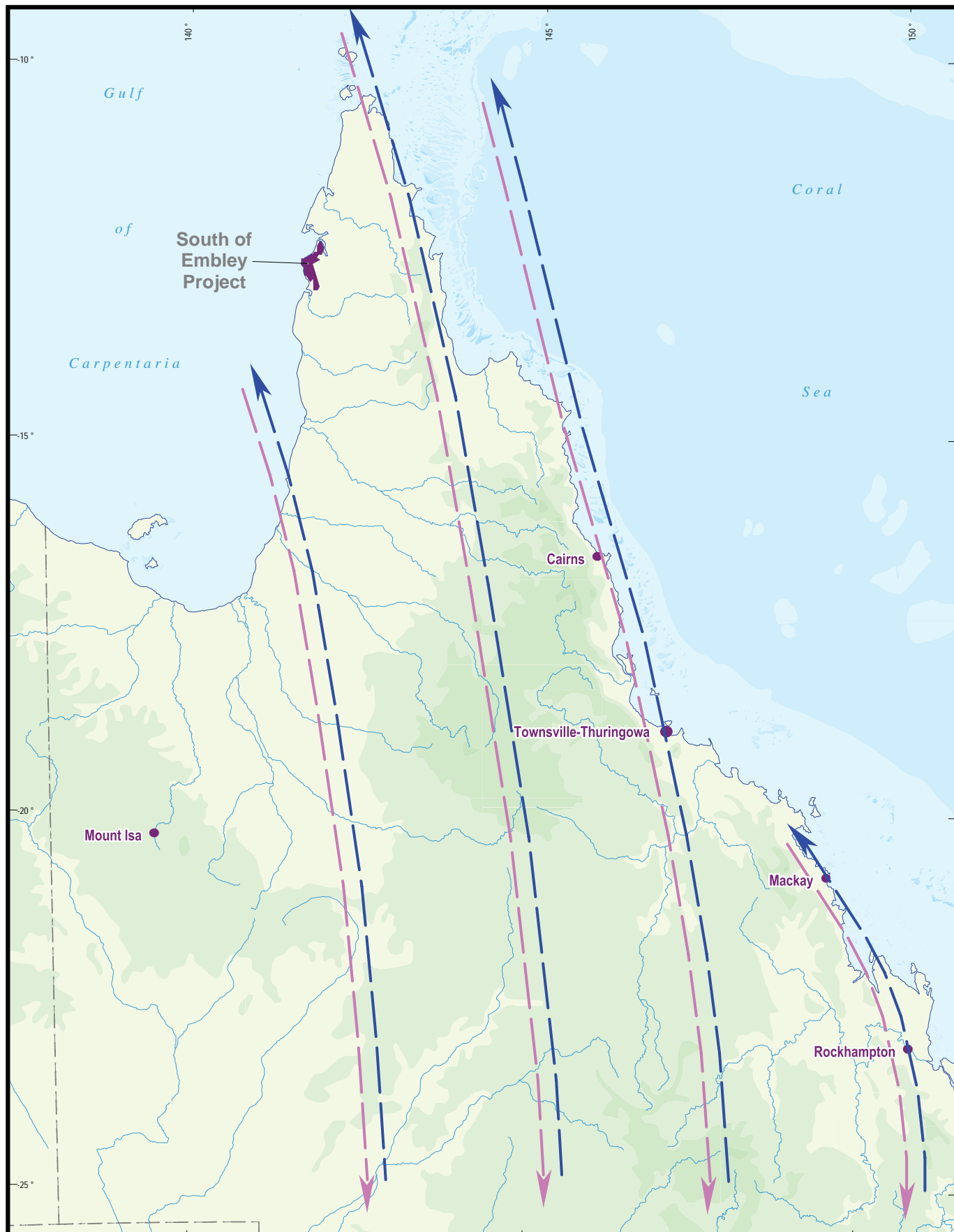




South of Embley Project

**Fig. 8-8: Notional Migratory Pathways for Barn Swallow**





Rio Tinto Alcan

- Project Area
- Locality
- River

**Aerial Species**

- Summer Migration (Spring Arrival)
- Winter Migration (Autumn Departure)

**South of Embley Project**  
**Fig. 8-9: Notional Migratory Pathways for Aerial Species**



150      0      150km

Datum/Projection: GDA94/MGA Zone 54    Date: 17/09/2012



## 8.3 Survey Methodology

### 8.3.1 General Approach

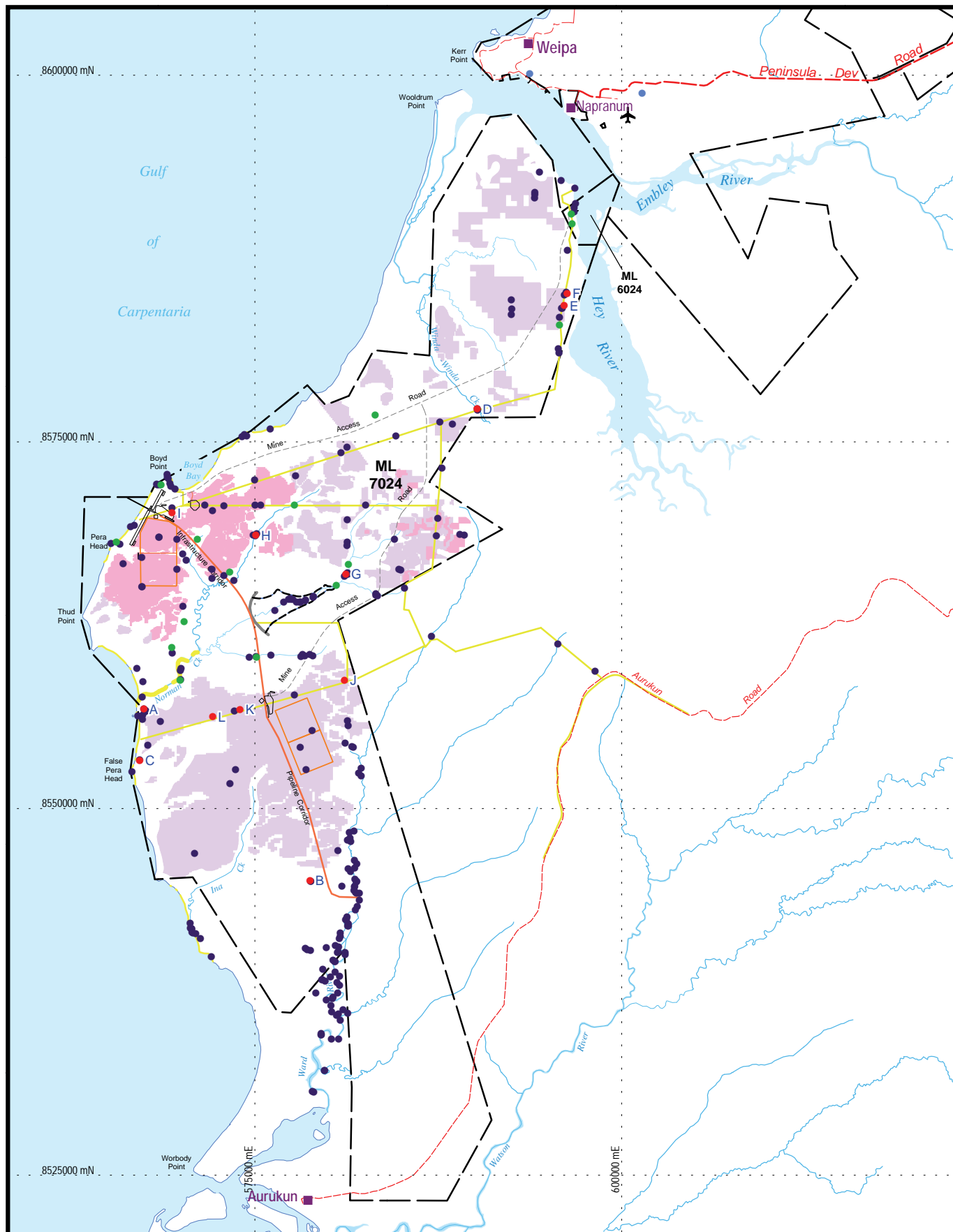
Survey effort for all of the migratory avian groups comprised the general survey effort applied at survey sites, traverses for targeted surveys throughout the wider Project area and opportunistic sightings during all survey activities. These activities provided survey effort across a range of habitats during different seasons and were appropriate given the range of habitats known to be widely used by the migratory bird groups. Shorebirds were the only group where targeted survey effort was applied given the specialised habitats used by the species. These targeted surveys were undertaken across a range of tidal conditions (refer **Section 8.3.3.1**) and also provided opportunity to detect other migratory species such as raptors and seabirds.

**Table 8-3** summarises the diurnal survey activities that were applicable to detecting the various migratory bird groups. **Figure 8-10** shows survey locations for migratory birds.

**Table 8-3 Survey Effort for Migratory Avian Groups**

Survey activity	Total survey effort (hours)	International migratory shorebirds	Waterbirds	Seabirds	Raptors	Woodland birds	Barn Swallow	Aerial species
<i>Targeted (migratory avian) Fauna Surveys - December 2007/2008, May 2008/2009, October 2012 - total survey period of 30 days</i>								
Foot traverses*	174	X	X	X	X	X	X	X
Coastal observations	30	X		X	X	X	X	X
ATV beach traverses	9.5	X		X	X	X	X	X
Boat traverse of Norman Creek	6.5	X	X	X	X	X	X	X
Vehicle traverses	69			X	X	X	X	X
<i>Comprehensive Surveys - May 2007, May 2008 - total survey period of 18 days</i>								
Bird searches	18		X		X	X	X	X
Vehicle traverses	54			X	X	X	X	X
<i>Supplementary Surveys - July 2006, May 2007, May 2008 - total survey period of 12 days</i>								
Bird searches	13		X		X	X	X	X
Vehicle traverses	36			X	X	X	X	X
Foot traverses	18	X	X	X	X	X	X	X

\* Note that foot traverses were conducted across a range of habitat types and that the total survey effort was not relevant to all migratory bird groups.



RioTinto Alcan

- RTA Mining Lease boundary
- Locality
- Road/track
- - - Freshwater dam
- Tailings storage facility
- Mining Years 1 - 13
- Mining Years 14 - 40
- Comprehensive survey site (A - L)
- Supplementary survey site
- Targeted Migratory Avian Fauna Survey Site
- ATV beach traverse
- Boat traverse
- Vehicle traverses
- Important Habitat**
- Great and Lesser Frigatebird Roosts (Identified through field observation)

South of Embley Project

**Fig. 8-10: Migratory Avian Species Survey Sites**



5 0 5km

Datum/Projection: GDA94/MGA Zone 54 Date: 01/11/2012

### 8.3.2 General Results

**Table 8-4** summarises the occurrence and habitats of migratory birds within the Project area.

One of the key objectives of field surveys was to determine whether any areas utilised by migratory birds within the Project area comprised 'important habitat' (refer **Section 8.1.2**). It was concluded that the 'important habitat' criteria was not met for any of the migratory avian species that occur within the Project area because:

- none of the migratory avian species present occur as ecologically significant proportions of the overall population of the species. There do not appear to be any especially significant population characteristics or processes occurring within the Project area that indicate ecological significance;
- the habitat within the Project area is similar to habitat occurring elsewhere on Western Cape York and is not especially important to any of the species at any life-cycle stage;
- there would be limited disturbance to the important foraging habitat of the Lesser Frigatebird in over-water areas off the Project area and an impact on the species is unlikely. No areas of 'important habitat' for other seabird species were identified within the Project area;
- no distributional limits for any of the migratory avian species occur within the Project area; and,
- none of the migratory avian species present within the Project area are known or anticipated to be declining in the vicinity of the Project area.

The two Frigatebird roost areas located near Weipa represent the only important habitat for migratory avian species within the immediate vicinity of the Project area. These areas are regarded as important as they support an ecologically significant proportion of the overall Great Frigatebird and Lesser Frigatebird population in north eastern Australia. No such mainland roosts of the species were located within the Project area and the Weipa roosts shall not be directly or indirectly affected by the Project.

### 8.3.3 International Migratory Shorebirds

#### *8.3.3.1 Survey Approach*

Survey guidelines for 36 migratory shorebird species are provided by DEWHA (2009a, 2009b) and outline the recommended survey requirements for migratory shorebirds. These guidelines were published after the completion of the Project EIS field surveys. The guidelines specify the need for survey timing to coincide with the period when the majority of migratory shorebirds are present in the survey area (i.e. in the north this is at the beginning and end of the non-breeding season). The survey guidelines recognise that while count surveys are preferable, the window of time in which count surveys can be conducted is narrow and, where count surveys are not possible, a thorough habitat assessment must be carried out to identify potential habitat. The guidelines recommend four replicate surveys to be conducted during different tidal conditions. The guidelines do not specify the effort for areas where minimal numbers of birds are present.

**Table 8-4 Species Profiles**

Group	Preferred Habitat	Potential habitat within Project area	Population in Project area	Likelihood of Occurrence within Project area
International migratory shorebirds	International migratory shorebirds utilise a variety of habitat types for foraging including tidal mudflats and sandflats, inland lakes or waterways and estuaries. Roost habitats can include beaches, rocky headlands, mangroves and clay pans. A number of internationally significant sites occur across Queensland. The nearest significant site is the south east Gulf of Carpentaria, approximately 500km south of the Project area.	International migratory shorebird habitat within the Project area includes coastal intertidal zones and estuarine waterways found along the Gulf shoreline, the lower and upper estuary of Norman Creek, Hey Point estuary, and the coastal wetlands associated with Norman Creek and the Ward River.	The Project area is situated within the East Asian-Australasian Flyway. Migrating individuals could be present within the Project area during August to May with overwintering individuals potentially present at other times of the year.	<p><b><u>Mining Area</u></b></p> <p><b>Unlikely:</b> Mining areas do not overlap with the favoured wetland habitats of these species.</p> <p><b><u>Infrastructure footprint</u></b></p> <p><b>Likely:</b> Isolated individuals may forage in the Port area. The wetland and riparian habitats in the Dam C area are unlikely to be utilised by the species. The mangroves in the vicinity of the proposed Hey River terminal have been identified as of low suitability for shorebird roosting.</p> <p><b><u>Balance of the Project Area not disturbed</u></b></p> <p><b>Known to Occur:</b> Five species confirmed as present with a further three species likely and 14 species possible.</p>
Waterbirds	Preferred habitats for waterbird species include, but are not limited to, river shallows, estuaries, tidal mudflats, freshwater wetlands and large dams.	Available habitat within the Project area includes all natural and artificial wetlands, waterways and intertidal flats. Habitat for the Clamorous Reed-warbler includes those wetlands that support reed beds.	Only modest numbers of waterbirds were observed within the Project area.	<p><b><u>Mining Area</u></b></p> <p><b>Unlikely:</b> Mining areas do not overlap with the favoured wetland habitats of these species.</p> <p><b><u>Infrastructure footprint</u></b></p> <p><b>Possible:</b> The riparian and colluvial habitat corridor within the Dam C footprint may be utilised by the Great Egret or Glossy Ibis during the wet season but these habitats do not represent key habitat for these species.</p> <p><b><u>Balance of the Project Area not disturbed</u></b></p> <p><b>Known to Occur:</b> Four species confirmed within the Project area with an additional species likely to occur.</p>

Group	Preferred Habitat	Potential habitat within Project area	Population in Project area	Likelihood of Occurrence within Project area
Seabirds	Seabirds utilise coastal waters and open ocean for feeding. Seabird species are known to breed in colonies on beaches and offshore islands.	Seabird habitat within the Project area includes the coastal waters and estuary inlets to the west of the site. Scattered dunal areas found within the Project area may accommodate breeding colonies for the Little Tern ( <i>Sterna albifrons</i> ).	Substantial seabird populations occur within the Project area, particularly associated with the Gulf coastline.	<p><b><u>Mining Area</u></b></p> <p><b>Unlikely:</b> Mining areas do not overlap with the favoured coastal habitats of these species.</p> <p><b><u>Infrastructure footprint</u></b></p> <p><b>Known to Occur:</b> All three species forage along the coastline where the Port would be constructed.</p> <p><b><u>Balance of the Project Area not disturbed</u></b></p> <p><b>Known to Occur:</b> Three species confirmed within the Project area in coastal habitats. No frigatebird roosts located or anticipated within the Project area. There would be limited disturbance to the important foraging habitat of the Lesser Frigatebird in over-water areas off the Project area.</p>
Raptors	The Eastern Osprey ( <i>Pandion cristatus</i> ) and White-bellied Sea-eagle ( <i>Haliaeetus leucogaster</i> ) are wide ranging bird species which occupy marine and terrestrial habitats. Preferred habitat for the Eastern Osprey includes coasts, estuaries, bays and inlets. The White-bellied Sea-eagle utilises the same habitats as the Eastern Osprey as well as large rivers and inland lakes. Both bird species nest in tall trees within 1km of water.	Habitat for both raptor species within the Project area includes tall trees lining the coastline and estuaries. Fringing riparian woodland would also provide nesting opportunities for the White-bellied Sea-eagle. Habitat within the Project area includes mangrove and estuarine communities, wetlands and riparian woodland, coastal foreshore, beach and tidal flats.	Both species are well established within the Project area and surrounding region with residential breeding pairs.	<p><b><u>Mining Area</u></b></p> <p><b>Unlikely:</b> Mining areas do not overlap with the favoured coastal habitats of these species.</p> <p><b><u>Infrastructure footprint</u></b></p> <p><b>Known to Occur:</b> Both species forage along the coastline where the Port would be constructed.</p> <p><b><u>Balance of the Project Area not disturbed</u></b></p> <p><b>Known to Occur:</b> Both species confirmed throughout the Project area.</p>



Group	Preferred Habitat	Potential habitat within Project area	Population in Project area	Likelihood of Occurrence within Project area
Woodland Species: Rainbow Bee-eater / Oriental Cuckoo	Both the Rainbow Bee-eater ( <i>Merops ornatus</i> ) and Oriental Cuckoo ( <i>Cuculus saturatus</i> ) are known to occur within a variety of habitats including open woodlands, riparian zones, cliffs, mangroves and rainforest.	All habitats within the Project area are considered potential habitat for both species.	The Rainbow Bee-eater is well established in the Project area with resident individuals. The Oriental Cuckoo is likely to be present at low densities during summer migration between September and May.	<p><b><u>Mining Area</u></b>  <b>Known to Occur:</b> Darwin Stringybark woodland habitat that occurs within the mining area is utilised by the species.</p> <p><b><u>Infrastructure footprint</u></b>  <b>Known to Occur:</b> The Rainbow Bee-eater confirmed in these areas and the Oriental Cuckoo also likely to occur.</p> <p><b><u>Balance of the Project Area not disturbed</u></b>  <b>Known to Occur:</b> The Rainbow Bee-eater is common in a variety of habitats, but mainly in association with beach, estuary, vine forest and riparian habitats. The Oriental Cuckoo is likely to be present in small numbers in similar wide arrays of habitats.</p>
Woodland Species: Satin Flycatcher / Rufous Fantail / Black-faced Monarch	The Satin Flycatcher ( <i>Myiagra cyanoleuca</i> ), Rufous Fantail ( <i>Rhipidura rufifrons</i> ) and Black-faced Monarch ( <i>Monarcha melanopsis</i> ) are known to utilise rainforest, <i>Eucalypt</i> woodlands and riparian zones and mangroves.	Potential habitat within the Project area for these species includes the riparian and alluvial woodlands, vine forest and paperbark woodlands and wetland swamps. Additionally these species may utilise the coastal vine forest, mangrove and estuary communities found across the Project area.	<p>The Rufous Fantail is common within the Project area in favoured habitats during winter migration period.</p> <p>The Satin Flycatcher also likely to be present during winter migration period.</p> <p>The Black-faced Monarch is possibly present during non-summer months.</p>	<p><b><u>Mining Area</u></b>  <b>Unlikely:</b> Mining areas do not overlap with the favoured dense forest habitats of these species.</p> <p><b><u>Infrastructure footprint</u></b>  <b>Likely:</b> The Rufous Fantail and Satin Flycatcher are likely to utilise the dense riparian habitats within the Dam C area. The Black-faced Monarch possibly uses this area.</p> <p><b><u>Balance of the Project Area not disturbed</u></b>  <b>Known to Occur:</b> The Rufous Fantail was found to be common in the Project area in favoured dense habitats comprising mangroves, riparian gallery forest, vine forest and <i>Melaleuca</i> wetland.</p> <p>The Satin Flycatcher and Black-faced Monarch likely to occupy similar habitats to the Rufous Fantail but especially riparian gallery forest and <i>Melaleuca</i> wetlands.</p>

Group	Preferred Habitat	Potential habitat within Project area	Population in Project area	Likelihood of Occurrence within Project area
Barn Swallow	The Barn Swallow ( <i>Hirundo rustica</i> ) is often recorded in open country, near water, towns and cities. Habitats in which this species is known to occur include freshwater wetlands and paperbark woodland.	Within the Project area potential habitat for the Barn Swallow includes Darwin Stringybark woodland, riparian gallery forest and alluvial woodland, paperbark woodland, foreshore, vine thicket, mangrove and estuarine communities.	Likely to occur during summer migration.	<p><b><u>Mining Area</u></b></p> <p><b>Possible:</b> The species may forage above Darwin Stringybark woodland in proposed mining areas.</p> <p><b><u>Infrastructure footprint</u></b></p> <p><b>Likely:</b> The species is likely to forage in infrastructure areas.</p> <p><b><u>Balance of the Project Area not disturbed</u></b></p> <p><b>Likely:</b> Habitats likely to be occupied by this species include naturally open areas such as beach, estuary and coastal swamps throughout the Project area.</p>
Aerial species	Aerial species spend day and night on the wing and are known to occupy airspace across most habitat types.	It is considered that both aerial species would occupy airspace above the entire Project area.	Both species likely to be present during summer migration period October-March.	<p><b><u>Mining Area</u></b></p> <p><b>Likely:</b> Airspace above all habitats likely to be utilised.</p> <p><b><u>Infrastructure footprint</u></b></p> <p><b>Likely:</b> Airspace above all habitats likely to be utilised.</p> <p><b><u>Balance of the Project Area not disturbed</u></b></p> <p><b>Known to Occur:</b> Both species confirmed within coastal and riparian habitats but likely to utilise airspace above all habitats.</p>

Note: The preferred habitats of migratory birds in the vicinity of shipping routes are provided in **Appendix 4A**.

Given the location of the Project area within the East Asian-Australasian Flyway, migratory shorebirds were identified in preliminary reviews as a key fauna group for field surveys. Field surveys within the Project area coincided with the typical departure period (April-May surveys 2008 and 2009) and the period following the initial arrival of birds (December 2007 and 2008) and were thus appropriate for detecting migratory shorebirds when they are most likely to be using habitats along the east coast of the Gulf of Carpentaria. May survey events were also suitable for detecting individuals that were over-wintering in Australia or undertaking a late departure for the northern hemisphere. December survey events were appropriate for detection of all species potentially utilising the Project area during the middle of the southern hemisphere season. Surveys during the wet season were not possible due to access and safety issues associated with the Project area. The wet season generally extends from November to April, with access to the Project area limited from December onwards, depending on the season.

Surveys conducted within the Project area that were applicable to migratory shorebirds totalled approximately 111 hours in duration comprising 65 hours of foot traverses, 30 hours of static coastal observations, 9.5 hours of ATV beach traverses, and 6.5 hours of boat traverses on Norman Creek (refer **Table 8-5**). This survey effort was employed during five survey events in December 2007 and 2008, and April / May 2008 and 2009 and October 2012 to coincide with the arrival and departure period for migratory shorebirds within the Gulf area. Surveys were undertaken during a range of tidal conditions and during different times of the day but predominantly between dawn and mid-afternoon. A number of observational surveys were undertaken during the high tide period (i.e. within two hours either side of high tide) when roosting birds are most evident. High tide surveys were undertaken during December survey events at the following locations:

- the sandy bar at the mouth of Norman Creek;
- along Norman Creek between the mouth and 3.5km upstream;
- the sandy spit at Boyd Point;
- at Hey Point in the vicinity of the proposed ferry terminal;
- at the waterfall seabird roost site; and,
- the rocky points and associated sandpits at Pera Head and False Pera Head (Amban).

**Table 8-5 Survey Effort for International Migratory Shorebirds**

Survey Activity	No. days upon which conducted	Duration of survey activity (average hours per day)	Total survey effort for activity (hours)
Foot traverses	34	5	65 <sup>#</sup>
Coastal observations	9	3.3	30
ATV beach traverses	2	4/5.5	9.5
Boat traverse of Norman Creek	1	6.5	6.5
<b>Total</b>			<b>111</b>

<sup>#</sup> Based on 1/3 of foot traverses covering wetland or shore habitats.

The October 2012 survey involved coastal walks and static observations at the site of the proposed Hey River terminal. This timing coincides with the peak arrival time stated in the *Draft Background Paper to EPBC Act Policy Statement 3.21 – Significant Impact Guidelines for 36 Migratory Shorebird Species* (DSEWPAC 2009b). This survey effort also specifically assessed the potential for use of these mangroves as a high tide roost.

Additionally a survey team spent two full days/nights (several tidal cycles) in December 2008 moored in the Ward River Estuary undertaking both boat and foot traverses within estuary habitats (mangroves, tidal flats).

RTA also undertook extensive habitat surveys as described in **Section 4.2.1**.

Initial observations of likely shorebird habitats including the Gulf shoreline, the lower and upper estuary of Norman Creek, Hey River estuary, and coastal wetlands associated with Norman Creek and the Ward River revealed a notable paucity of migratory shorebirds both in terms of species diversity and density of individuals. Extensive observational traverses in suitable habitat did not reveal any groups bigger than six individuals. It was also noted that despite the large rise and fall of tides that can occur in the Gulf, the Project area did not support any extensive inter-tidal flats and the shoreline of the coast in particular was predominantly sandy and of sufficient gradient to expose only minimal tidal flats at the mouth of Norman Creek. Furthermore, seasonal coastal wetlands formed by freshwater inundation of marine plains during the wet season were invariably dry during December survey events and frequently heavily impacted by feral pig activity.

Dedicated observation sessions for migratory shorebirds were subsequently conducted at a number of locations within the Project area in order to further assess the apparent paucity of migratory shorebirds. Survey locations included the coastline between Pera Head and Red Cliffs, at Ina Creek, south of False Pera Head, and between False Pera Head and Norman Creek; the Hey River estuary around Hey Point and the proposed Hey River terminal location; seasonal coastal wetlands associated with Norman Creek and the Ward River; and, the lower Norman Creek estuary to the mouth. A combination of static observation sessions with a spotting scope, ATV traverses of beaches, and boat based observations were employed during these surveys.

In terms of survey effort, the timing and methodology employed during surveys generally satisfies the survey guidelines; however, in response to the paucity of shorebirds evident during surveys, the survey approach employed focussed on continually extending the search area for migratory shorebirds rather than undertaking count surveys of a handful of individuals.

On the basis of these survey observations and despite an initial intention to conduct targeted surveys of international migratory waders, it was considered that there was an insufficient presence of these species to warrant dedicated counts of individuals and mapping of feeding areas, and subsequent survey effort relied on overall survey activities as outlined above.

#### **8.3.3.2 Survey Results**

Only five species of migratory shorebird were recorded within the Project area during surveys (refer **Table 8-2**). The largest group of migratory shorebirds observed at any one time was six Whimbrels (*Numenius phaeopus*) flying up the Norman Creek estuary. No high tide roosts of any migratory shorebird were observed during surveys nor were any foraging aggregations observed during lower tides.

Isolated roosting shorebirds (Lesser Sand Plover and Whimbrel) were occasionally observed in larger roosts of Terns on the coastal beaches particularly in the vicinity of Waterfall Creek, and foraging birds (Whimbrel, Eastern Curlew, Marsh Sandpiper, Common Greenshank) were observed infrequently on either the Ward River, Norman Creek or Hey River estuaries. Tidal and wetland habitats within the Embley and Hey River estuaries and along the coastline adjacent to the Project area do not provide extensive or productive feeding grounds for these species and although waders are present in these habitats they occur at relatively low densities.

A further two species (Great Knot, Common Sandpiper) were observed downstream of the Project area in the Ward River estuary and given the availability of similar estuary habitat within the Project area associated with Norman Creek, Ward River, Winda Winda Creek and the Hey / Embley River system, it is anticipated that these species are likely to occur in the Project area. Latham's Snipe is also assessed as likely to occur within the Project area given the availability of suitable freshwater and estuarine wetland habitat. A further 14 species are identified as possible inhabitants of the Project area given the habitats present (refer **Table 8-2**). The survey results suggest, however, that no migratory shorebird species is likely to be abundant within the Project area.

The October 2012 survey at the site of the proposed Hey River terminal resulted in the following observations. The mangrove community present consisted of a narrow (single tree width) fringe restricted to the high tide mark due to the steeply-shelving nature of the coast at this site. Mangrove trunks were generally sparsely placed at one stem per three or four linear metres on average. The scant cover afforded by this mangrove community appeared to offer low roost habitat values due to the reduced security of the narrow mangrove fringe.

Two unidentified birds were observed during the October 2012 survey period. Neither bird could be confirmed as a migratory shorebird however the call of the first and shape and colouration of the second allowed tentative identification as shorebirds. No further observations of shorebirds within the mangroves or greater estuary system were made. The structure of the habitat and paucity of sightings indicate that the mangrove community in the vicinity of the proposed Hey River terminal does not act as significant shorebird roost habitat.

The paucity of migratory shorebirds within the Project area is attributed to the lack of inter-tidal flat habitat, the dry nature of coastal wetlands during the late dry season until wet season rains occur, and a possible low productivity of inter-tidal benthic habitats potentially related to the very low sediment loads emanating from contributing spring fed drainages and the extraordinarily low mineral status of these waters. The survey results establish clearly that there are no internationally or nationally important sites or locations for migratory shorebirds located within or immediately adjacent to the Project area, and furthermore the Project area does not support an ecologically significant proportion of any migratory shorebird population. Specifically, in response to the criteria provided by the Commonwealth for assessing important habitat for migratory shorebirds (DEWHA 2009b):

- the Project area does not contain any sites identified as internationally important for migratory shorebirds;
- the Project area does not contain any sites that support 0.1% or more of the flyway population of any migratory shorebird species given the very low densities of birds recorded during surveys;
- the Project area does not contain any sites that were observed to support 2000 or more individual migratory shorebirds, with the largest group of individuals observed comprising six individuals; and,
- the Project area does not contain any sites that were observed to support 15 or more migratory shorebird species, with the total number of migratory shorebird species recorded for the entire Project area comprising five species.

Consequently the Project area is not regarded as a significant component of the migratory pathway for migratory shorebirds entering the Gulf of Carpentaria even though the Gulf waters in general form part of the East Asian-Australasian Flyway.

Given the very low density of international migratory shorebirds observed within the Project area and a lack of extensive foraging habitat, no areas of 'important habitat' for these species were identified within the Project area.

#### 8.3.4 Waterbirds

Four of the five migratory waterbird species initially identified as potentially occurring in the Project area were confirmed to be present, comprising the Clamorous Reed-Warbler, Great Egret, Eastern Reef Egret and Glossy Ibis. They predominantly utilise the more extensive wetland areas associated with the estuarine reaches of the main drainage systems, with the largest aggregations of species observed on the lower Ward River system, downstream of the Project area. Suitable migratory waterbird habitats within the Project area comprise paperbark woodland and wetland swamps, mangrove and estuarine habitats, tidal flats and foreshore habitat. The fifth species, the Sarus Crane, was not observed during field surveys but is likely to occur within the Project area in association with extensive coastal wetlands.

No large-scale roosts of confirmed species were observed within the Project area; however, it is possible that roosts and/or breeding of some of the species may occur within these habitats. However, these wetland habitats would not be directly affected by mining or infrastructure associated with the Project.

Within the Project area, migratory waterbirds (apart from the Reef Egret) are likely to have a greater presence during the wet season when freshwater pools and creeks are full. As these wetland systems begin to dry up, waterbirds are likely to migrate to areas outside of the Project area in search of permanent freshwater systems.

Based on the assessment criteria listed in **Section 8.1.2** (DEWHA 2009b), the Project area is not regarded as especially significant for these species and no areas of 'important habitat' for these species were identified.

#### 8.3.5 Seabirds

The Little Tern was observed at one location within the Project area, at the seabird roost area located on a sandbar near Waterfall Creek. This species is expected to utilise the coastline, sand bars and estuarine habitats throughout the Project area for foraging and roosting. There is limited potential breeding habitat present within the Project area due to the prevalence of coastal bauxite cliffs which curtail sand dune development, but the scattered dunal areas that are present could accommodate breeding colonies. Overall numbers of observed individuals were low, but densities may vary widely during the year as the three populations of the species interact in the area.

The Great Frigatebird and Lesser Frigatebird were recorded within the Project area on numerous occasions. Results from targeted coastal surveys and casual observations indicated that the Great Frigatebird and Lesser Frigatebird were common along the western coastline of the Project area during the December 2007, May 2008 and December 2008 survey events but were notably not observed during the May 2009 survey. The species also occurs over the Hey / Embley River estuary system and most likely overlaps with adjacent areas of the north eastern section of the Project area.

The only known mainland roosts of the Great and Lesser Frigatebirds occur near Weipa, on the northern side of the Embley River. One is located on the eastern edge of Weipa northwest of Humbug Wharf, and another adjacent the East Weipa mine area and the Weipa Airport. No Frigatebird roosts were observed within the Project area. The individuals observed within the Project area are anticipated to be associated with the roosts north of the Embley River and return there each evening, although there is likely to be regular turn-over of individuals using the Weipa roosts in relation to the on-set of breeding activity.



Based on the assessment criteria listed in **Section 8.1.2** (DEWHA 2009b), the areas that would be disturbed by the Project are not regarded as especially significant for these species. There would be limited disturbance to the important foraging habitat of the Lesser Frigatebird in over-water areas off the Project area and an impact on the species is unlikely. No areas of 'important habitat' for other seabird species were identified within the Project area.

### 8.3.6 Raptors

Both the Eastern Osprey and White-bellied Sea-eagle were frequently observed in coastal habitats throughout the Project area. Indeed these species are ubiquitous within beach and estuary habitats throughout the Project area and also utilise seasonal freshwater wetlands on the lower reaches of the main drainage systems (Ward River, Norman Creek, Winda Winda Creek). During the 2007-2009 surveys an active nest of the Eastern Osprey was recorded in a Darwin Stringybark tree approximately 40m from the cliffs at Boyd Bay which probably represents a typical location for nests of this species and the White-bellied Sea-eagle, in close proximity to coastal foraging habitat. During 2012 surveys this nest was observed to have fallen to the ground however the birds had re-nested nearby, approximately 300m from the cliffs.

Based on the assessment criteria listed in **Section 8.1.2** (DEWHA 2009b), the Project area is not regarded as especially significant for these species and no areas of 'important habitat' for these species were identified within the Project area.

### 8.3.7 Woodland Birds

#### 8.3.7.1 *Rainbow Bee-eater/Oriental Cuckoo*

The Rainbow Bee-eater was observed throughout the Project area most frequently in association with beach, estuary, vine forest and riparian habitats. The species is most active foraging in more open habitats adjacent to denser vegetation types and utilising perches from the taller vegetation to venture into open areas to catch prey before returning to perch. The Rainbow Bee-eater was also observed less frequently within Darwin Stringybark woodland often in association with tracks or open areas.

The Oriental Cuckoo was not observed during field surveys but is a cryptic species that does not call and so has low detectability. Nevertheless, this species is expected to occur within the Project area in low densities in association with similar edge habitats favoured by the Rainbow Bee-eater.

Based on the assessment criteria listed in **Section 8.1.2** (DEWHA 2009b), the Project area is not regarded as especially significant for these species and no areas of 'important habitat' for these species were identified within the Project area.

#### 8.3.7.2 *Satin Flycatcher/Rufous Fantail/Black-faced Monarch*

The Rufous Fantail was found to be common in the Project area in favoured dense habitats comprising mangroves, riparian gallery forest, vine forest and *Melaleuca* wetland. It is likely that the species occurs within these habitats throughout the Project area. The Satin Flycatcher was not confirmed within the Project area during field surveys but is anticipated to be present during winter months following migration from southern parts of mainland Australia. The Black-faced Monarch was also not confirmed within the Project area but may possibly be present especially during non-summer months when individuals return from the southern breeding migration. It is likely that both the Satin

Flycatcher and Black-faced Monarch would occupy similar habitats throughout the Project area to the Rufous Fantail, especially riparian gallery forest and *Melaleuca* wetlands.

Based on the assessment criteria listed in **Section 8.1.2** (DEWHA 2009b), the Project area is not regarded as especially significant for these species and no areas of 'important habitat' for these species were identified within the Project area.

#### **8.3.8 Barn Swallow**

The Barn Swallow was not confirmed within the Project area but is likely to occur at least intermittently during summer months following migration from the northern hemisphere. Habitats likely to be occupied by the species include naturally open areas such as beach, estuary and coastal swamps throughout the Project area.

Based on the assessment criteria listed in **Section 8.1.2** (DEWHA 2009b), the Project area is not regarded as especially significant for these species and no areas of 'important habitat' for these species were identified within the Project area.

#### **8.3.9 Aerial Species**

Both the White-throated Needletail and Fork-tailed Swift were confirmed within the Project area. The White-throated Needletail was recorded along the coast at False Pera Head, and the Fork-tailed Swift was recorded foraging over estuary, coastal swamp habitats and at False Pera Head.

Both species are likely to occur above all habitats within the Project area but especially in association with coastal and estuary habitats where morning and evening sea breezes provide favourable soaring conditions.

Based on the assessment criteria listed in **Section 8.1.2** (DEWHA 2009b), the Project area is not regarded as especially significant for these species and no areas of 'important habitat' for these species were identified within the Project area.

## 8.4 Relevant Impacts

Using each avian migratory group's potential occurrence across the Project area, an impact assessment was conducted for each phase of the Project (construction phase and operational phase). Given that the impacts in both phases are similar, the potential direct and indirect impacts are discussed together.

A key consideration in the assessment of the significance of relevant impacts on migratory avian species is whether any 'important habitat' occurs and would be impacted within the Project area (refer **Section 8.1.2**). Field surveys confirmed that no important habitat areas for such species occur within the Project area (refer **Section 8.3**).

The only potential important habitat of a migratory avian species that occurs in proximity to the Project area are over-water foraging areas for the Lesser Frigatebird off the Project area and the roosts of the Lesser and Great Frigatebird located near the Weipa township. The limited disturbance in the foraging area mean there is unlikely to be an impact on the Lesser Frigatebird and the roost areas do not occur within the Project area and would not be impacted by the Project.

### 8.4.1 Direct Impacts Prior to Mitigation

No important habitat for migratory avian species would be directly affected by the Project-related construction and operation activities.

There would be some long term loss of general habitat. The largest impacts to general habitat would be for species that use the Darwin Stringybark woodland (i.e. Rainbow Bee-eater/Oriental Cuckoo; Barn Swallow, and aerial species group). However, as noted in **Section 3.10.4** and **6.3.4.6**, the overall impact to these habitats would be minor as it would be progressively rehabilitated and there is a significant amount of similar general habitat in the Project area and subregion which would not be impacted (refer **Section 3.10.4** and **6.3.4.6** for additional details). The progressive rehabilitation of mining areas will aim to return self-sustaining native vegetation communities that would provide the same function for migratory birds as the pre-mining landscape. Given the preference of all three species to utilise naturally open habitats and disturbed habitat such as parks and gardens (refer **Sections 8.2.5.1** and **8.2.7**) it is anticipated that the species would utilise both mature and developing rehabilitated areas.

For the Rainbow Bee-eater, Oriental Cuckoo and Barn Swallow, Darwin Stringybark woodland represents only one of the wide range of habitat types utilised within the Project area. All three species are likely to concentrate activity within coastal and riparian habitats located outside of the mine footprint, where habitat characteristics provide conditions more favoured by the species for foraging.

For the aerial species group, foraging habitat comprises the airspace above terrestrial habitats and the availability of prey within this zone is not necessarily related to the terrestrial habitat located directly below it, as evidenced by this species foraging equally over natural and disturbed habitat types.

Direct disturbance of habitat for the remaining migratory avian groups would be minimal as these species have more specific patterns of habitat utilisation within habitats that would be unaffected by mining and largely unaffected during construction. International migratory shorebirds are restricted to coastal and wetland habitats that would not be affected by mining disturbance and would be subject to limited disturbance during construction only. Only 400m<sup>2</sup> of mangrove would be impacted at the Hey River terminal, which represents 0.008% of mangroves within the Project area. There would therefore be negligible impact to any high-tide roosts of the Grey-tailed Tattler, Whimbrel, and Terek

Sandpiper or any other wader species (note that no high tide roosts were observed in this area). Similarly the Satin Flycatcher, Rufous Fantail and Black-faced Monarch favour denser vegetation types including mangroves, riparian gallery forest, vine forest and *Melaleuca* wetland which would only be subject to limited disturbance.

No roosts of the Lesser or Great Frigatebird occur within areas that would be disturbed by the Project and disturbance to these species habitats is restricted to a very small extent of disturbance to foraging habitat in coastal areas. The nearest roost trees near Weipa are several hundred metres from the proposed Humbug barge terminal and adjacent to an existing industrial area and wharf. This Frigatebird roosting area has co-existed with the Lorim Point industrial area for over 40 years and long experience indicates that the birds are largely unaffected by the substantial industrial activity in the area. Impacts associated with light from the Humbug barge terminal would occur within a background of substantial existing light emissions and would have a negligible impact on the roost area. There is no suitable nesting habitat for the Little Tern at the site of the temporary seaborne access infrastructure near Pera Head and Boyd Point/Boyd Bay and this area was not observed to be used for roosting by the species.

Mortality of migratory avian species is possible during site preparation and vegetation clearing; however, substantial levels of mortality are considered highly unlikely due to the majority of the identified migratory species favouring habitats that would be largely unaffected by the proposed works, and the tendency for birds to take flight to avoid direct disturbance.

#### 8.4.2 Indirect Impacts Prior to Mitigation

No important habitat for migratory avian species would be indirectly affected by the Project.

Migratory avian species may be affected in the short-term by noise and/or movement originating from operational activities, such as clearing and operating heavy vehicles. Bird species would generally temporarily move away from the source to avoid these impacts and would return to the area when the disturbance ceases. It is not expected that noise impacts would cause significant impacts to migratory avian species during either the construction or operational phases of the Project as elevated noise levels are expected to be minor and localised. Additional details on noise effects on fauna are provided in **Section 15.2**.

As with noise, disturbance from light may have a short-term effect on migratory avian species. Birds would generally move away from any bright light to avoid being exposed. As much of the mine infrastructure and mining area is situated within timbered habitats, light emissions would generally be attenuated within a short distance upon entering vegetated areas and the affected area subsequently minimised. For the migratory avian groups identified in the Project area, potential light disturbance is most relevant for the international migratory shorebirds and waterbirds groups, individuals of which may forage at night. Lighting at the Port and barge/ferry terminals has the potential to deter foraging shorebirds however neither of these areas provide particularly valuable foraging habitat or represent high tide roost areas and only a very small number of individuals are likely to be affected. For waterbirds, their wetland and riparian habitat is located away from mining areas and most infrastructure areas such that night-time light impacts would be negligible.

Frigatebird individuals would not be affected by additional light (they do not forage at night) or air emissions as the nearest roost trees near Weipa are several hundred metres from the proposed Humbug barge terminal and adjacent to an existing industrial area and wharf. Short term impacts associated with noise (including noise from piling) and air quality from construction at the Humbug barge terminal would occur within a background of substantial existing noise emissions and would

have a negligible impact on the roost area. With respect to the Little Tern there is no nesting habitat within the vicinity of coastal infrastructure and these areas were also not identified as high tide roost sites for the species, so there is unlikely to be any substantial lighting effect on the species.

High dust levels could possibly deter migratory avian species from affected areas of habitat in the short term; however, air quality modelling completed for the Project concluded that dust impacts would be relatively minor and localised and therefore it is not anticipated that changes in air quality would impact migratory avian species. Additional details on air quality are provided in **Section 14.3**.

The international migratory shorebirds and waterbird species groups are susceptible to substantial changes to wetland habitats brought about by altered hydrological regime, water quality, or fire, weed and feral animal impacts. Assessments of potential effects on wetland and riparian ecosystems from altered surface and ground water regimes due to mining concluded that small long term localised changes may occur but were likely to be within the range attributed to natural variation in these systems, and that no substantial changes were likely (refer **Section 16.2** for additional details). The presence of Dam C would lead to an appreciable annual decline in flows immediately downstream on the particular branch of the Norman Creek on which it is built. However, the flows in this small tributary does not provide important habitat for these species. When the Norman Creek catchment is considered as a whole, the overall decline in mean annual flow (15%) is well within the range of normal year-to-year variation. The impact on the hydrological regime as a result of pumping from the Ward River was also modelled and found to be minor. The annual volume of water pumped from the Ward River would be capped at 1% of mean annual river flow at the pump station and the rate of pumping at all times would be less than 20% of the river flow rate. On this basis, impacts on migratory birds from altered hydrological regime are not anticipated. Similarly, the Project is not anticipated to incur adverse changes to fire, weed or feral animal regimes that may substantially adversely affect general habitat for migratory birds.

### 8.4.3 Summary of Impacts Prior to Mitigation

**Table 8-6** summarises potential unmitigated impacts on migratory species associated with the Project.

**Table 8-6 Summary of Direct and Indirect Impacts Prior to Mitigation for Migratory Avian Species**

Impact	Summary of Impacts Prior to Mitigation
<b>Direct Impacts</b>	
Clearing and loss of habitat	<p>The only potential important habitat for the Lesser Frigatebird is over-water foraging areas off the Project area. The limited disturbance on foraging areas mean there is unlikely to be an impact on the Lesser Frigatebird.</p> <p>Negligible impact on general habitat, long term.</p> <p>There would be some loss of general habitat specifically for species that use the Darwin Stringybark woodland. However, as noted in <b>Section 3.10.4</b> and <b>6.3.4.6</b>, the overall impact would be minor as habitat would be progressively rehabilitated and there is a significant amount of similar general habitat in the Project area and subregion.</p>
Edge effects	<p>Negligible, long term, short term.</p> <p>Edge effects are anticipated to be negligible given the small amount of high suitability habitat displaced and the negligible noise light and air quality impacts.</p>

Impact	Summary of Impacts Prior to Mitigation
Fragmentation of habitat	Negligible, long term. Fragmentation impacts are anticipated to be small given the highly mobile nature of these species.
Effects on movement/breeding/ feeding patterns	Negligible, long term. The small amount of fragmentation of habitat caused by clearing for construction would not affect these highly mobile species.
Altered light regime	Negligible, short term. Lighting would only affect a very small proportion of overall habitat for migratory avian species. Only a very small number of individuals of species which forage at night are likely to be affected and would be able to relocate to nearby similar habitat away from lights. Impacts associated with light from the Humbug barge terminal would occur within a background of substantial existing light emissions.
<b>Indirect Impacts</b>	
Water quality	Negligible, long term. Impacts on water quality are discussed in <b>Section 16.2.5</b> . There are no impacts on water quality anticipated that would indirectly impact migratory avian species through modification of habitat.
Altered hydrological regime	Negligible, long term. Substantial hydrological change in migratory avian habitats is not anticipated during construction or operations (refer to <b>Sections 16.2</b> and <b>16.4</b> ).
Noise	Negligible, short term. Increases in noise would be relatively minor and localised compared to existing conditions (refer to <b>Section 15.2</b> ).
Air quality	Negligible, short term. Increases in air emissions would be relatively minor and localised (refer to <b>Section 14.3</b> ). The species are highly mobile and could move.
Introduction of weeds and pests	Negligible, long term. The Project is unlikely to lead to the introduction of any invasive weeds or fauna that could affect migratory avian species.
Altered fire regime	Negligible, long term. Construction and operational activities are not anticipated to incur adverse changes to the current fire regime to an extent that could affect migratory avian species.



## 8.5 Avoidance, Mitigation, Enhancement Measures and Residual Impact

Negligible impacts on migratory avian species are anticipated and therefore no specific mitigation is warranted. However, the following avoidance measures would be implemented to further reduce impacts on migratory avian species:

- the proposed SoE environmental buffer system would exceed the requirement of the Coordinator General's approval conditions and comprise a methodology for determining set-back distances from sensitive vegetation, instead of from the banks of watercourses and wetlands, which include those habitats which are predominantly utilised by avian migratory species. The sensitive vegetation that would be buffered by Darwin Stringybark woodland would comprise the following vegetation types: riparian, wetland, estuarine, vine forest and coastal vegetation on sand. RTA would work with Traditional Owners and the relevant WCCCC Sub-committee on establishment of environmental buffers as part of the CHEMA. The proposed SoE environmental buffer system would maintain a network of undisturbed habitats and would be enhanced through the proposed fire management program (refer **Section 6.3.4.2** for additional details) which would conserve fire sensitive flora and promote overall vegetation diversity and the feral pig control program (refer **Section 7.3.6.4** for additional details) which would reduce pig damage to riparian and wetland areas. Additional details are included in **Section 6.3.4.5**; and,
- the general avoidance measures discussed in **Section 3.13** further reduce impacts by siting facilities in areas with less sensitive habitat.

The following mitigation and enhancement measures would also be implemented to further reduce overall impact or would provide positive outcomes for these species:

- progressive rehabilitation enabling the establishment of habitat that can be utilised by some Water Birds and Woodland Birds (refer **Section 3.10**). The largest area of un-rehabilitated land (approximately 9,000ha) would occur at about Year 30. The largest area of rehabilitated land less than 10 years old (9,000ha) would occur at about Year 45;
- a fire management program would be developed and implemented (refer **Section 6.3.4.2** for additional details);
- a weed management program would be developed and implemented prior to commencement of construction, and would include weed surveys annually (post wet season) targeting operational areas and site routes (refer **Section 6.3.4.3** for additional details); and,
- the proposed feral pig control program aims to reduce feral pig populations in riparian areas where their foraging causes disturbance (refer to **Section 7.3.6.4**).

An environmental management plan outline for migratory avian species which summarises these avoidance, mitigation and enhancement measures is provided in **Appendix 8-A**. The cost of key avoidance, mitigation and enhancement measures are summarised in **Appendix 5-B**.

**Table 8-7** summarises potential impacts on migratory avian species following mitigation as a result of the Project, in terms of the significant impact criteria for matters of NES. Importantly, no 'important habitat' for migratory avian species would be substantially modified, destroyed or isolated by the Project and therefore a significant impact on migratory avian species is not anticipated.

**Table 8-7 Impact Assessment Summary– Migratory Avian Species**

<i>Will the proposed works...</i>	<b>Refer to Table 6 for a list of the migratory avian species covered by this assessment</b>
<i>... 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;</i>	The migratory species confirmed as present, likely or possibly occurring within the Project area predominantly utilise habitats that would be located within the proposed SoE environmental buffers and not directly affected by mining and only minimally affected by infrastructure development. The vast majority of habitats utilised by these species would be unaffected by the Project. The only potential important habitat (for the Lesser Frigatebird) is over-water foraging areas off the Project area. The limited disturbance of foraging areas mean there is unlikely to be an impact on the Lesser Frigatebird.
<i>... result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;</i>	The Project is unlikely to lead to the introduction of any invasive fauna that could affect migratory species. Proposed control measures for weeds would avoid the spread of invasive weeds within habitats of the migratory species.
<i>... seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.</i>	Serious disruption to the life cycle of any migratory species confirmed as present, likely or possibly occurring within the Project area is not anticipated.

### 8.5.1 National Recovery Plans and Threat Abatement Plans

The Wildlife Conservation Plan for Migratory Shorebirds (DEH 2006) is listed as a national recovery plan for the international migratory shorebirds identified in **Table 8-2**. **Table 8-8** summarises the consistency of the Project against DEH (2006). There are no national recovery plans for other listed avian migratory species identified in **Table 8-2**.

The *Threat Abatement Plan for the Predation by the European Red Fox* (DEWHA 2008c) is listed on the SPRAT database as being relevant to the Little Tern. No foxes were identified during field surveys for the EIS (refer **Section 4.2.1.7**) and they are unlikely to occur on Cape York. There are no other threat abatement plans relevant for other listed avian migratory species identified in **Table 8-2**.

**Table 8-8 Consistency of SoE Project with the Wildlife Conservation Plan for Migratory Shorebirds**

Objective	Action	Consistency of the SoE Project with the Threat Abatement Plan
<p>Increase international cooperation for migratory shorebirds and ensure that countries of the East Asian - Australasian Flyway work together to conserve migratory shorebirds and their habitat.</p>	<ul style="list-style-type: none"> <li>• Through leadership, encourage participation by countries throughout East Asia, South East Asia and Australasia, and particularly those countries with sites of international importance for migratory shorebirds, in activities to conserve migratory shorebirds.</li> <li>• Lead the development and implementation of an action plan for migratory shorebird conservation in the East Asian - Australasian Flyway.</li> <li>• Include at least 25% of the known sites of international importance for migratory shorebirds in Australia in the Flyway site network.</li> <li>• Through example, encourage information sharing on migratory shorebird conservation activities across the Flyway.</li> <li>• Develop and support training programs in population monitoring and habitat management for site managers in Australia and throughout the Flyway.</li> <li>• Encourage shorebird migration and population dynamic research across the Flyway.</li> </ul>	<p>Not applicable.</p>
<p>Identify, protect and sustainably manage a network of important habitat for migratory shorebirds across Australia to ensure that healthy populations remain viable into the future.</p>	<ul style="list-style-type: none"> <li>• Agree and adopt criteria for identification of sites of national and regional importance.</li> <li>• Review the boundary of large sites to ensure that they are appropriate.</li> <li>• Using agreed criteria and reviewed boundaries assess the importance of sites.</li> <li>• Encourage the production and dissemination of maps for important sites to assist with their management.</li> <li>• Identify threats to important habitat and develop conservation measures for managing them.</li> <li>• Identify priority sites for conservation action based on their importance to migratory shorebirds, the level of threat and</li> </ul>	<p>Consistent:</p> <ul style="list-style-type: none"> <li>• Threats, potential impacts and proposed mitigation measures have been identified for international migratory shorebirds that are known, likely or possible occur within the Project area.</li> </ul>

Objective	Action	Consistency of the SoE Project with the Threat Abatement Plan
	<p>adequacy of existing management arrangements.</p> <ul style="list-style-type: none"> <li>• Encourage and support the development of appropriate management arrangements for important sites, particularly those identified as priority sites.</li> <li>• Develop a directory of organisations and people responsible for managing important sites throughout Australia.</li> <li>• Develop and support training programs in population monitoring and habitat management for site managers in Australia.</li> <li>• Support the Flyway Partnership on migratory waterbirds, through encouraging and supporting nomination of wetlands of international importance to the migratory waterbird site network.</li> <li>• Encourage nomination of wetlands of international and national importance for inclusion as Wetlands of International Importance under the Ramsar Convention on Wetlands and/or A Directory of Important Wetlands in Australia and inclusion in Protected Areas.</li> <li>• Include migratory shorebirds and their habitat in environment protection arrangements at Local, State and National level to avoid significant impacts on migratory shorebird populations.</li> </ul>	
<p>Increase biological and ecological knowledge of migratory shorebirds, their populations, habitats and threats in Australia to better inform management and support the long term survival of these species.</p>	<ul style="list-style-type: none"> <li>• Identify gaps in knowledge required for management of migratory shorebirds, their habitats and threats in Australia.</li> <li>• Prioritise and support research on migratory shorebirds, their population and conservation status, habitats and threats to address knowledge gaps.</li> <li>• Identify and implement ways to integrate research and enhance collaboration.</li> <li>• Encourage shorebird movement and migration research within Australia and across the Flyway.</li> <li>• Develop and implement a consistent national method to monitor migratory shorebird populations.</li> </ul>	<p>Not applicable.</p>

Objective	Action	Consistency of the SoE Project with the Threat Abatement Plan
	<ul style="list-style-type: none"> <li>• Encourage ongoing population monitoring programs for species covered by this plan.</li> <li>• Encourage research on reproduction and survival rates of migratory shorebirds and trends of these over time.</li> <li>• Collect and make available information resulting from research projects.</li> </ul>	
<p>Raise awareness of migratory shorebirds and the importance of conserving them, and increase engagement of decision makers and the community in Australia in activities to conserve and protect migratory shorebirds and their habitat.</p>	<ul style="list-style-type: none"> <li>• Promote public and community education and conservation awareness, through strategic programs and educational products.</li> <li>• Identify existing migratory shorebird and wetland communication networks and where possible use these networks to promote conservation of migratory shorebirds.</li> <li>• Develop and implement a communication strategy to promote the exchange of information on shorebird conservation and habitat management, between all levels of Government, non-government organisations, Natural Resource Management regional bodies, Industry and Communities.</li> <li>• Distribute demonstration materials and models for community engagement in shorebird conservation activities.</li> <li>• Prepare supplementary administrative guidelines on significance for migratory shorebirds to assist with EPBC Act referrals and determining whether an action has, will have, or is likely to have a significant impact on migratory shorebirds.</li> </ul>	<p>Not applicable.</p>

## 8.6 Offset Measures

Under the *EPBC Act Environmental Offsets Policy* (DSEWPaC 2012b), offsets are not required where the residual impact is not likely to be significant (when assessed against the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DEWHA 2009c)).

**Section 8.4** and **Section 8.5** of this report documents the results of the impact assessment process and concludes that with the implementation of the proposed mitigation measures, the residual impacts associated with the construction and operation of the Project on migratory avian species would be negligible and therefore not significant (refer **Section 8.1.2**). As such, offsets relating to migratory avian species are not required under the Commonwealth offsets policy.