

Part 6: Matters of national environmental significance

20. Matters of national environmental significance

20.1 KEY STATUTORY REQUIREMENTS, POLICY AND GUIDANCE

20.1.1 Objectives

The EPBC Act objective that relates to matters of national environmental significance is:

To provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance.

20.1.2 Legislation and International Conventions

Commonwealth

As discussed in Section 1, the EPBC Act establishes a process for the assessment and approval of proposed actions that have the potential to significantly impact on matters of national environmental significance or on Commonwealth land. The controlling provisions relevant to this proposal are:

- Sections 18 and 18a (Listed Threatened Species and Communities),
- Section 20 (Listed Migratory Species), and
- Sections 23 and 24a (Commonwealth Marine Areas).

The Environment Protection and Biodiversity Amendment Regulations 2000 make provision for the regulation of the interaction of persons with cetaceans within the Australian Whale Sanctuary²¹.

The Listed Migratory Species protected under the EPBC Act includes those listed under the following international conventions:

- Japan-Australia Migratory Bird Agreement (JAMBA);
- China-Australia Migratory Bird Agreement (CAMBA);
- Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA); and
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

20.2 OVERVIEW

This section provides a summary of the information relevant to matters of national environmental significance contained within various sections of this PER/Draft PER including:

- Section 3 (Existing environment, including threatened and migratory species, heritage values, water quality and habitat for threatened and migratory species, and the Commonwealth marine area);
- Section 7 (Benthic Primary Producer Habitat, including an analysis of impacts due to proposed dredging on habitat value for a range of species, including threatened and migratory species);
- Section 8 (Mangroves, including an analysis of impacts due to changes in hydrodynamics a proposed causeway);
- Section 9 (Marine Fauna, including an analysis of direct and indirect impacts on threatened and migratory species, and impacts on habitats that these species may depend on);
- Section 10 (Water and Sediment Quality);
- Section 11 (Hydrocarbon spills);
- Section 12 (Terrestrial Vegetation); and
- Section 13 (Terrestrial fauna, excluding migratory waders).

²¹ The Australian Whale Sanctuary covers Australian waters within 200 nautical miles of the coast of Australia.

This section has a full discussion on matters of national environmental significance related to migratory and marine birds, including migratory waders (this factor was not discussed in Section 13).

A summary of the matters of national environmental significance as applicable to the Proposal area is provided in Table 20.1

Table 20.1 Matters of national environmental significance and their relevance to the Proposal area.

Matter of National Environmental Significance	Relevance to Proposal area
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Importance (Ramsar Sites)	None
Threatened Ecological Communities	None
Threatened Species	<ul style="list-style-type: none"> Several Threatened terrestrial fauna species may occur (refer Section 20.4.3), but were not recorded in field surveys; The threatened subterranean fauna species blind gudgeon may occur within the Pilbara coastal plain area but has a low probability of being present in the Proposal area; Several of the marine mammals and turtles that do occur are listed as Threatened; one Threatened fish species (green sawfish) was recorded (Refer Section 9 and Section 20.4.1). No threatened flora species were recorded.
Migratory Species	<ul style="list-style-type: none"> Migratory marine mammals and turtles occur in the Proposal area. (Refer Sections 3.3.9, 9, and 20.4.1); Migratory birds occur in the proposal area (Refer Section 20.4.2).
Nuclear Actions	None
Marine Actions (Affecting Commonwealth Marine Areas)	Disposal of dredge material within Commonwealth Marine Areas (Refer Section 7).

The assessment process under the EPBC Act is as discussed in Section 1.

20.3 STUDIES

20.3.1 Marine species

As detailed in Section 9, studies relevant to matters of national environmental significance (marine species) were completed to enable an assessment of potential impacts and support development of appropriate management plans. The key studies (included in Appendix 1) comprised:

- Supporting Study 9.1: Humpback Whale and other Megafauna
CWR. 2010. A description of humpback whale and other megafauna distribution and abundance in the western Pilbara using aerial surveys- 2009/2010. November. Report prepared by Centre for Whale Research (WA) Inc for API Management Pty Ltd, Como, Western Australia.
- Supporting Study 9.2: Marine Turtle Surveys
Pendoley Environmental. 2010. API Project Anketell Point marine turtle surveys. January. Report prepared by Pendoley Environmental Pty Ltd for AECOM Australia Pty Ltd, Perth, Western Australia.
- Supporting Study 9.3: Underwater Noise Assessment
SVT. 2010. Anketell Point Port Underwater Noise Assessment. December. Prepared by SVT for API Management Pty Ltd, Como, Western Australia.
- Supporting Study 9.5: Whale Impact Risk Assessment
AECOM 2010. Whale Impact Risk Assessment, Anketell Point Port. October. Report prepared by AECOM Australia Pty Ltd for API Management Pty Ltd, Como, Western Australia.

The field surveys provide an appropriate assessment of the marine fauna of the study area for the requirements of this PER/draft PER. The outcomes of the surveys have been concluded cognisant of survey uncertainties. Limitations of the field surveys are detailed in the relevant supporting studies.

Twenty two aerial surveys of marine mammals were undertaken between during the northern and southern whale migrations (2009/2010), in the waters off Anketell Point (Supporting Study 9.1). Relatively high numbers of humpback whales were recorded during the survey period (Figure 20.1) (see also Section 3.3.9)

Marine turtle beach usage surveys were undertaken in February 2008 and in January, March and October 2009 (Supporting Study 9.2) on mainland beaches, nearby islands and the beaches of the Dampier Archipelago. The purpose of the surveys was to quantify beach usage and nesting effort on beaches in the region of Anketell Point (see Section 3.3.9).

Several studies are ongoing including the marine turtle beach usage surveys and the marine mammal behavioural study (refer to Table 9.1). Any additional data from the ongoing surveys will be included within the Supplementary PER to be submitted under the EPBC Act process.

20.3.2 Terrestrial species

Several flora and fauna studies relevant to matters of national environmental significance were completed to enable an assessment of potential impacts and support development of appropriate management plans. The key studies (included in Appendix 1) comprised:

- **Supporting Study 12.1: Flora and Vegetation Assessment**
AECOM. 2010. Level 2 Flora and Vegetation Assessment of Proposed Anketell Point and Dixon Island proposed Port Development areas. July. Report prepared by AECOM Australia Pty Ltd for API Management Pty Ltd, Como, Western Australia.
- **Supporting Study 13.1: Terrestrial Vertebrate Fauna Survey**
Phoenix. 2010. Terrestrial Vertebrate Fauna Survey for Anketell Point Rail Alignment and Port Projects. July. Final report prepared by Phoenix Environmental Sciences Pty Ltd for API Management Pty Ltd, Como, Western Australia including addendum letter dated 28th September 2010.
- **Supporting Study 13.2: Migratory Wader Assessment**
AECOM. 2010. Migratory Wader Assessment Report. November. Report prepared by AECOM Australia Pty Ltd for API Management Pty Ltd, Como, Western Australia.

The detail of the methodology and approach employed by these surveys is discussed in the reports of the supporting studies themselves, each of which was designed and implemented to meet the requirements of the relevant EPA Guidance Statements.

The field surveys provide an appropriate assessment of the terrestrial flora and fauna of the study area for the requirements of this PER/draft PER. The outcomes of the surveys have been concluded cognisant of survey uncertainties. Limitations of the field surveys are detailed in the relevant supporting studies.

A summary of the methodology and approach employed by migratory wader survey (Supporting Study 13.2) is provided below.

Migratory Wader Surveys

- **Objectives and Scope:** The objectives of the migratory wader surveys were to: (i) compile a littoral bird species list for the Proposal area; (ii) determine the wider importance of the Proposal area habitats to migratory waders; and (iii) assess whether these habitats are likely to support migratory wader populations in excess of 1% of their flyway population.
- **Database Search:** Federal databases managed by DSEWPC were searched for species and communities listed under the EPBC Act, and the Birds Australia Birddata database was also interrogated for the Proposal area.
- **Survey Methods:** A two-day survey was conducted during each sampling period (March 2008, October 2008, March 2009, June 2009, July 2009, March 2010 and October 2010) at low tide and high tide. High tide surveys were conducted to determine the location and size of roosting flocks on Anketell Point and the surrounding locality (see Preliminary Shorebird Survey in Appendix A of Supporting Study 13.2). The Proposal area was divided into eight regions, and all littoral birds seen within each region were recorded as either in a roost (>10 birds) or outside a roost. Once a roost was located, the number of individuals of

all species within that roost was recorded. Low tide counts were also conducted on mudflats in the south-west and south-east parts of the study area and in the areas immediately surrounding Anketell Point.

20.3.3 Commonwealth Marine Areas

The Commonwealth Marine Area is a matter of national environmental significance under the EPBC Act. It is defined in the EPBC Act as any part of the sea, including the waters, seabed, and airspace, within Australia's Exclusive Economic Zone and/or over the continental shelf of Australia. Generally, the Commonwealth Marine Area stretches from the territorial sea baseline to the outer limit of the Exclusive Economic Zone, 200 nautical miles from the baseline. Key environmental impacts required to be assessed for Commonwealth Marine Areas are:

- Establishment of pest species;
- Impact on marine ecosystem functioning or integrity;
- Effect on a population of a marine species;
- Substantial change in water quality;
- Accumulation of potentially harmful chemicals in the marine environment; and
- Impact on heritage values.

Parts of two of the three proposed dredge material disposal areas fall in the Commonwealth Marine Area. A turbid plume associated with dredging and dredge material disposal is also predicted to occur in the Commonwealth Marine Area. The key studies (included in Appendix 1) relating to the characterisation of the Commonwealth Marine Areas potentially impacted comprised:

- Supporting Study 7.1: Marine Environmental Modelling
APASA 2010. Prediction of generation and dispersion of suspended sediments during the proposed dredging and disposal programme. Anketell Point marine environmental modelling. August. Report prepared by Asia-Pacific ASA Pty Ltd for API Management Pty Ltd, Como, Western Australia.
- Supporting Study 7.5: Benthic Habitat Assessment
AECOM 2010. Characterisation and mapping of benthic habitats within the Anketell Point region. Anketell Point Port marine benthic habitat assessment. August. Report prepared by AECOM Australia Pty Ltd for API Management Pty Ltd, Como, Western Australia.
- Supporting Study 7.6: Benthic Primary Producers
AECOM 2010. Characterisation and mapping of benthic primary producer habitats within the Anketell Point region. Anketell Point Port marine benthic primary producers. August. Report prepared by AECOM Australia Pty Ltd for API Management Pty Ltd, Como, Western Australia.
- Supporting Study 9.1: Humpback Whale and other Megafauna
CWR. 2010. A description of humpback whale and other megafauna distribution and abundance in the western Pilbara using aerial surveys - 2009/2010. November. Report prepared by Centre for Whale Research (WA) Inc for API Management Pty Ltd, Como, Western Australia.
- Supporting Study 10.1: Sediment Sampling and Analysis Implementation Report
Oceanica. 2010. Chemical characterisation of the sediment to be dredged and the surface material present within the proposed disposal areas. Anketell Point Port (APP) Sediment sampling and analysis implementation report. August. Report prepared by Oceanica Consulting Pty Ltd for API Management Pty Ltd, Como, Western Australia.
- Supporting Study 10.2: Addendum to Sediment Sampling and Analysis Implementation Report
API 2010. API West Pilbara Iron Ore Project – Stage 1. Addendum to Sediment Sampling and Analysis Implementation Report. October. Prepared by WorleyParsons for API Management Pty Ltd, Como, Western Australia.

The environmental values of the Commonwealth marine area have been described in preceding sections. Assessment of impacts are specifically addressed in the following sections:

- Establishment of pest species (Section 9);
- Impact on marine ecosystem functioning or integrity (Section 9);
- Effect on a population of a marine species (Section 9);

- Substantial change in water quality (Section 10);
- Accumulation of potentially harmful chemicals in the marine environment (Section 10); and
- Impact on heritage values (Sections 3, 16, 19).

20.4 OCCURRENCE OF THREATENED SPECIES

20.4.1 Marine species

A report produced by the EPBC Act Protected Matters Search Tool for marine and offshore waters adjacent to Anketell Point revealed eight Migratory species listed as Threatened and a further five Migratory species that may occur in proximity to the Proposal area (Table 20.2). Of these, 7 were recorded in the Proposal area during field surveys.

Table 20.2 Threatened and Migratory marine species present or likely to be present in the Anketell Point region

Scientific Name	Common Name	EPBC Listing Status	Type of Presence in Area
Dolphins			
<i>Sousa chinensis</i>	Indo-Pacific humpbacked Dolphin	Migratory	Species or species habitat likely to occur in area. Dolphins were observed during surveys (but species not identified).
<i>Tursiops aduncus</i>	Spotted bottlenose dolphin	Migratory	Species or species habitat likely to occur in area. Dolphins were observed during surveys (but species not identified).
Whales			
<i>Balaenoptera edeni</i>	Bryde's whale	Migratory	Species may occur in area. Small numbers recorded offshore of Proposal area during surveys.
<i>Balaenoptera musculu</i>	Blue whale	Endangered, Migratory	Species may occur in area. Not recorded during surveys.
<i>Megaptera novaeangliae</i>	Humpback whale	Vulnerable, Migratory	Species or species habitat known to occur within the region. Species was recorded during surveys*.
<i>Orcinua orca</i>	Killer whale	Migratory	Species may occur in area. Not recorded during surveys.
Marine Turtles			
<i>Carretta caretta</i>	Loggerhead turtle	Endangered, Migratory	Species or species habitat likely to occur in area Not recorded during surveys.
<i>Chelonia mydas</i>	Green turtle	Vulnerable, Migratory	Species or species habitat likely to occur in area. Species was recorded during surveys.
<i>Eretmochelys imbricata</i>	Hawksbill turtle	Vulnerable, Migratory	Species or species habitat likely to occur in area. Species was recorded during surveys.
<i>Dermochelys coriacea</i>	Leatherback turtle	Endangered, Migratory	Species or species habitat likely to occur in area. Not recorded during surveys.
<i>Natator depressus</i>	Flatback turtle	Vulnerable, Migratory	Breeding likely to occur within area. Species was recorded during surveys.
Other			
<i>Dugong dugon</i>	Dugong	Migratory	Species or species habitat likely to occur in area. Species was recorded during surveys.
<i>Rhincodon typus</i>	Whale shark	Vulnerable, Migratory	Species or species habitat likely to occur in area. Not recorded during surveys.

Source: EPBC Act online Protected Matters Search Tool (<http://www.environment.gov.au/erin/ert/epbc/index.html> accessed 24 August 2009). * Notes: Preliminary findings from aerial surveys undertaken by API indicate this species may rest/mill in Nickol Bay, west of the Proposal site during the southern migration (Supporting Study 9.1).

The coastal waters adjacent to Anketell Point are potential habitat for a range of whale species. The humpback whale (*Megaptera novaeangliae*) was the most commonly recorded species during aerial surveys of marine mammals undertaken for the Proposal. The distribution of humpback whales during the three phases of migration are shown in Figure 20.1 (see also Supporting Study 9.1). Bryde's whales were the most commonly sighted other large whale with a total of eight sightings between January to March 2010. Sightings of Bryde's whales coincided with peak numbers of krill and manta rays. A group of false killer whales (*Pseudorca crassidens*) were sighted over eighty kilometres offshore in July 2010. From August 2009 to July 2010, 702 humpback pods comprising 1069 whales were recorded (Supporting Study 9.1).

A small majority (52%) of observed whales were resting/milling. The peak of the resting/milling behaviour occurred in late July, during a transition period between the northern and southern migrations. These animals were more widely dispersed, although a discrete concentration was recorded approximately 20 km west of the proposed shipping channel, in Nickol Bay, in water depths averaging 10 m (Figure 3.11). Cow/calf pairs were found in highest densities inside Nickol Bay, and these data raise the possibility that Nickol Bay, in particular its northwest sector, may represent a resting area for south migrating whales. Data from an initial vessel-based survey suggests that the behaviour patterns recorded for cow/calf pairs in Nickol Bay are similar to those seen for cow/calf pairs in Exmouth Gulf, though the density of whales in Nickol Bay is significantly less than in Exmouth Gulf (CWR, unpublished data.), suggesting that the population that uses Nickol Bay is significantly smaller (refer Figure 3.12 of the PER/draft PER). The results of the initial vessel-based survey, to investigate the significance of Nickol Bay as a resting area, will be included within the Supplementary PER to be submitted under the EPBC Act process.

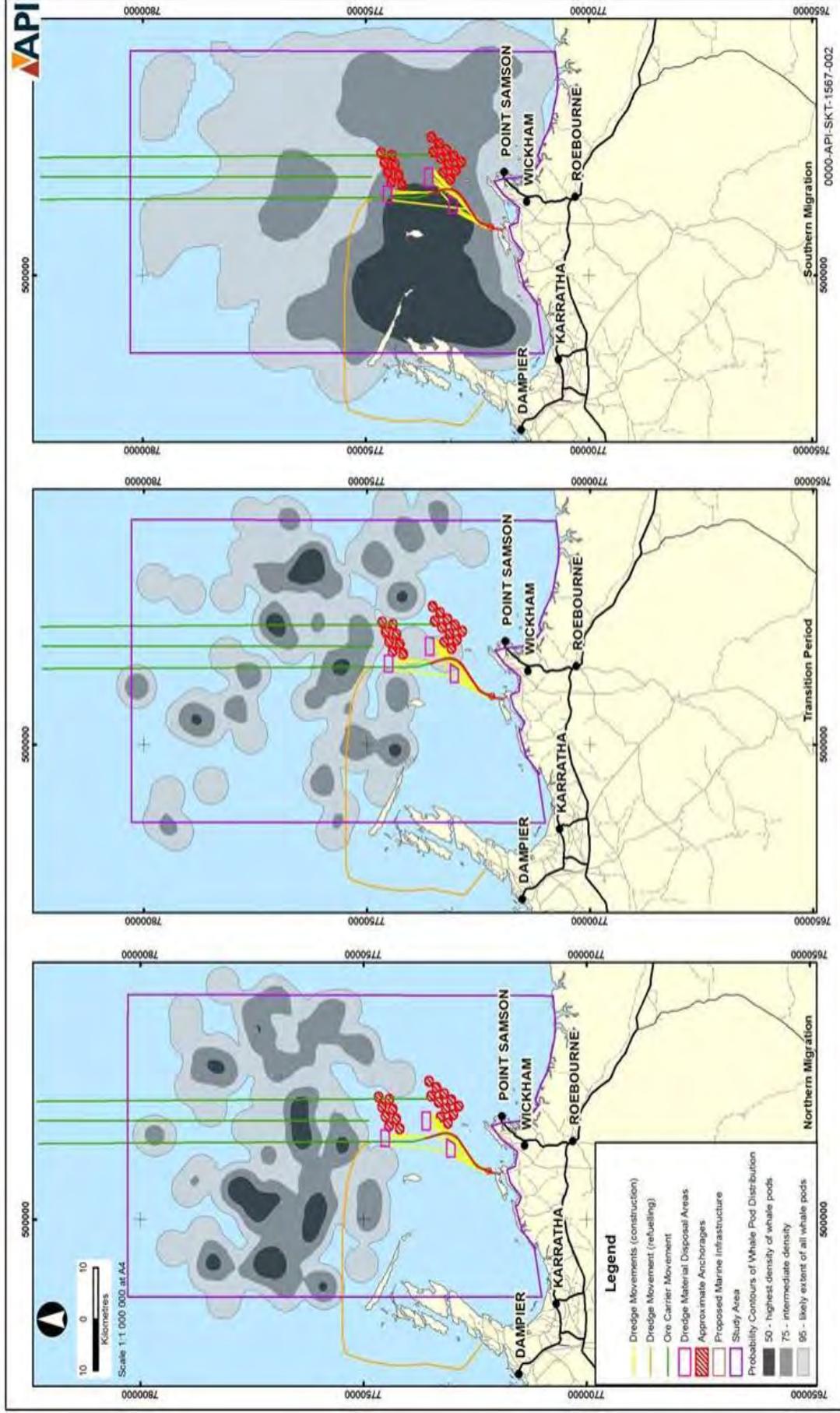
A total of 1281 dolphins (178 pods) were sighted during the aerial surveys (Supporting Study 9.1), with peak numbers observed during the 21 May 2010 flight. Dolphins were predominantly sighted in water depths less than 50 m (Figure 20.2). Dolphins recorded during aerial surveys were not identified to species level due to limitations in identification from the aircraft. Recorded animals are likely to be the inshore species, *Tursiops* spp. or *Sousa chinensis*, or offshore species, *Stenella* spp. (Jenner and Jenner, unpublished data from vessel surveys, Supporting Study 9.1). Characteristic of the Pilbara near coastal region, dolphins were observed to be widely dispersed at Nichol Bay. Dolphins were not sighted within the Anketell/Nickol Bay region in unusually high numbers (Supporting Study 9.1).

Significant marine turtle nesting beaches were found at Delambre, Legendre and Huay Islands during the marine turtle beach usage surveys (Figure 20.3 and Supporting Study 9.2). Moderate density turtle nesting beaches were found at Angel, Dixon and Gidley Islands; and mainland beaches generally exhibited low nesting density.

Most marine turtle nesting on mainland and Dixon Island beaches, near Anketell Point, is by flatback turtles and occasional hawksbill turtles. At high tide, juvenile green turtles have been observed in the mangroves lining the north side of Bouguer Passage (Supporting Study 9.2).

During the initial assessment of the importance of beaches in the vicinity of Anketell Point as turtle breeding sites (February 2008) of eight possible nesting beaches on Dixon Island, two (Beaches 4 and 5, both located along the eastern half of the north coast, see Figure 20.3) exhibited evidence of flatback turtle nesting. The closest beach is approximately 600 m from the proposed approach jetty causeway footprint. During a more detailed survey in January 2009, up to 33 flatbacks were found to visit Beach 5 on Dixon Island each night; and during the October 2009 survey, seven hawksbill turtles were recorded over a two-night period on this beach. The flatback and hawksbill turtle rookeries of Dixon Island are not considered regionally significant when compared with other nearby island rookeries such as Delambre Island (Supporting Study 9.2). A very low level of turtle nesting was also recorded at Beach 7 on Anketell Point in March 2009 (Supporting Study 9.2).

A single specimen of the green sawfish (*Pristis zijsron*), which is listed as vulnerable under the EPBC Act, was captured in mangrove habitat off Dixon Island (Indo-Pacific Environmental, 2008).



Source: Contours from Supporting Study 9.1

Figure 20.1 Contours showing spatial distribution of whales sighted during aerial surveys between 13 August 2009 and 27 July 2010, overlain with expected construction and operation vessel routes

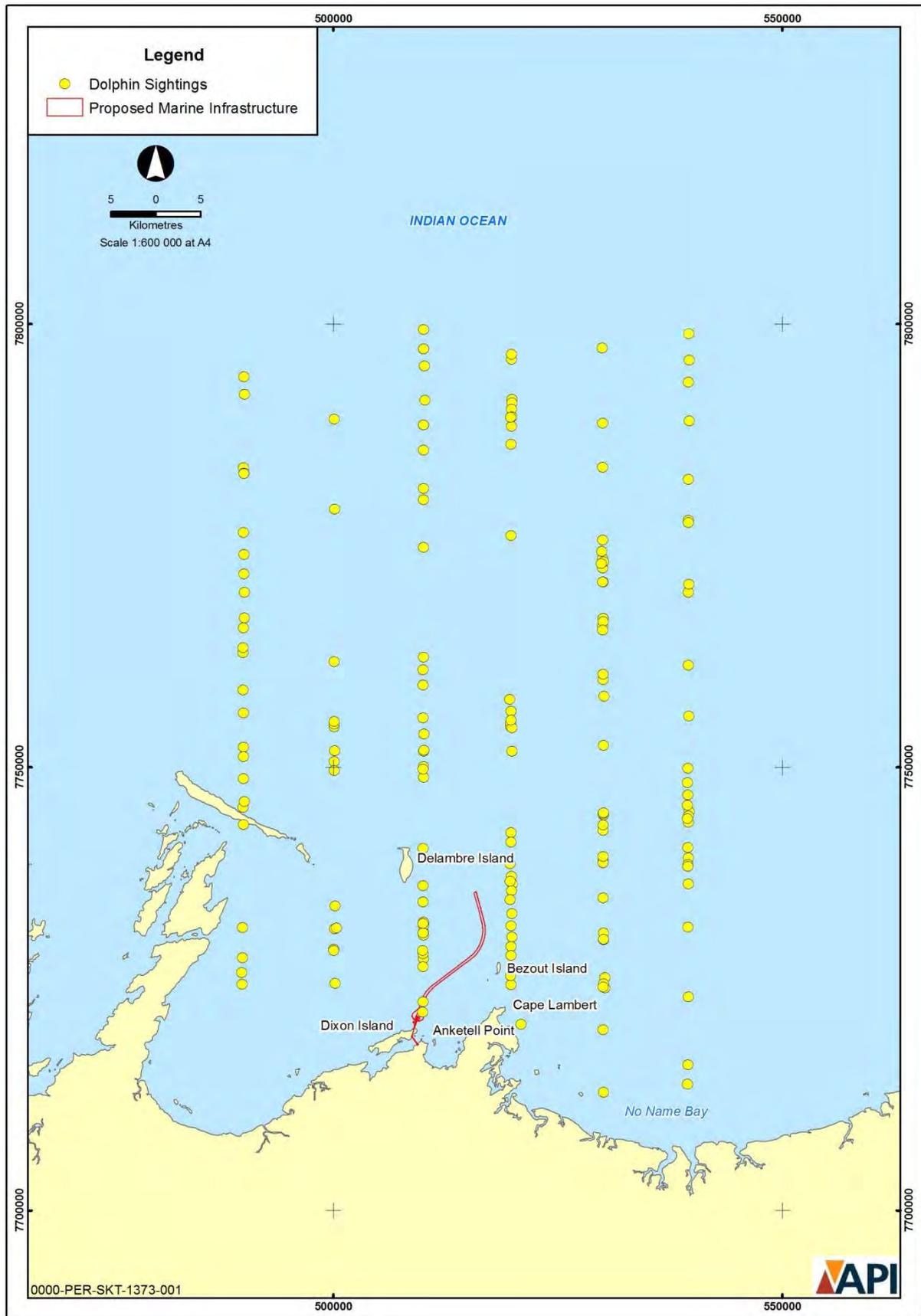


Figure 20.2 Spatial distribution of dolphins sighted during aerial surveys (13 August 2009 to 29 July 2010) (Supporting Study 9.1) Note: dolphin sightings were logged as occurring at the coordinates of the plane at the time of observation, giving risk to the apparent linear distribution.

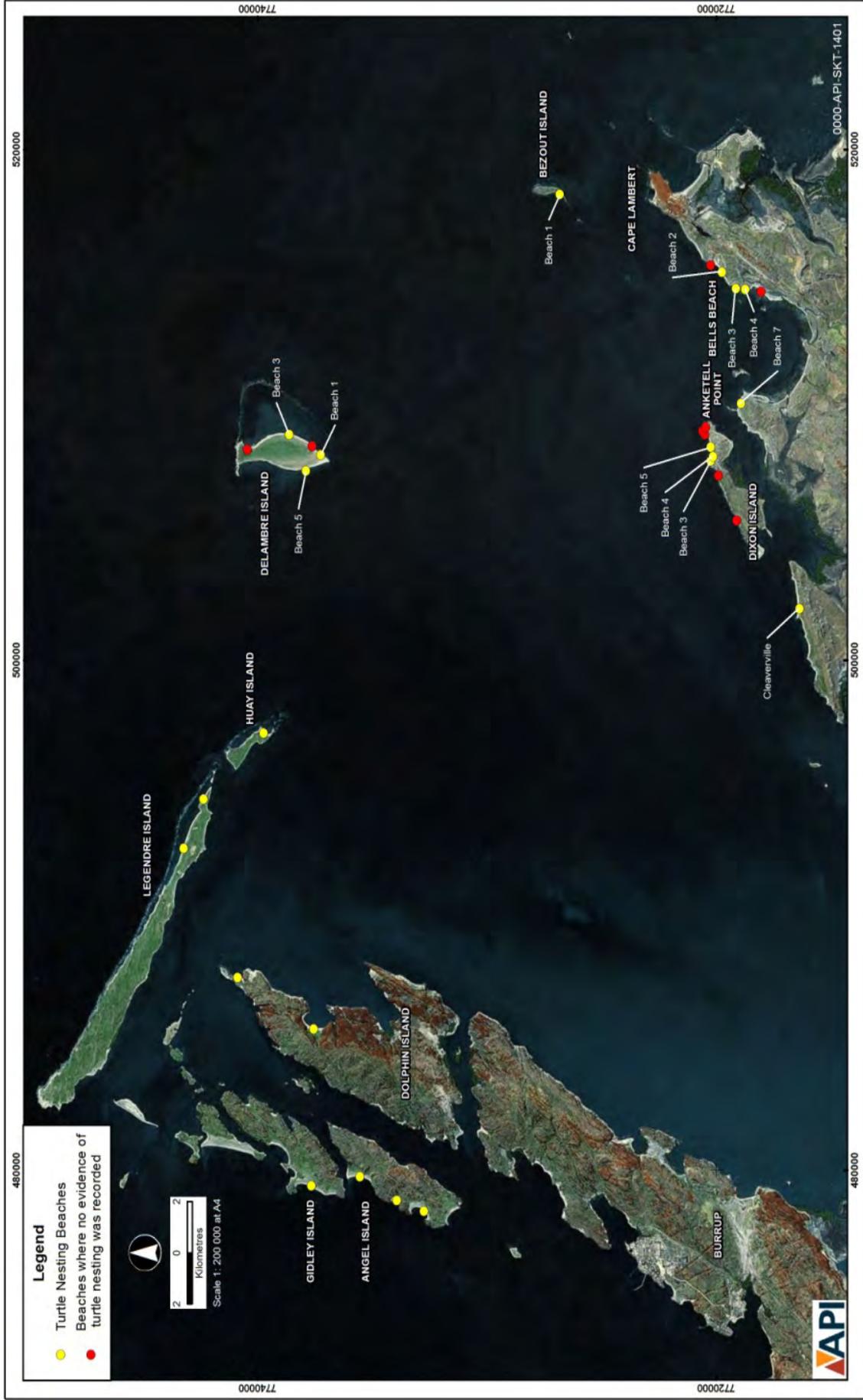


Figure 20.3 Marine turtle nest survey sites (Supporting Study 9.2)

20.4.2 Avifauna

The Anketell Point region is likely to be used by a range of migratory bird species that travel seasonally between Australia and northern Asia (Supporting Study 13.2). Migratory birds, including waders, undertake annual migrations of thousands of kilometres between their breeding areas in the Arctic and their non-breeding areas in Australasia, Africa and South America (Bamford *et al.*, 2008). Southward migration to non-breeding grounds in the southern hemisphere typically occurs from September to November. Waders summer in the non-breeding habitats (December to February), feeding intensively on invertebrates to build up stores of fat and protein in preparation for migration back to the Arctic (Bamford *et al.*, 2008; Priest *et al.*, 2002). Northward migration to the Arctic breeding grounds takes place between March and April, and waders capitalise on the abundant food supply during the Arctic summer (Bamford *et al.*, 2008).

The East Asian–Australasian Flyway, which stretches from Siberia and Alaska to Australia and New Zealand, is a geographic region supporting populations of migratory waders during annual migrations (Bamford *et al.*, 2008; DEWHA, 2008). It is one of eight major flyways recognised around the world and is used by about 8 million waders of 54 different species (Bamford *et al.*, 2008). Sites considered important to migratory waders are those that regularly support 1% or more of the flyway population of a species or that are known to regularly support more than 20,000 waders in total (Ramsar Convention, 2000).

Twenty-six species of migratory waders are known to pass through the Dampier Archipelago Region, spending the majority of their time foraging in littoral environments along the Pilbara coastline (Bamford *et al.*, 2008; DEWHA, 2008). These species are likely to utilise the coastal portions of the Proposal area during both the breeding and non-breeding seasons. Waders typically forage in shallow waters along coastal intertidal mudflats, estuaries, shorelines, and reefs and along the edges of inland wetlands (Geering, 2007; Watkins, 1993). During high tide, the waders are forced from the intertidal feeding grounds to roosting sites, which are important for bird survival. The surveys conducted for the Proposal focused on these locations to identify important roost sites in the Anketell Point–Dixon Island locality.

A number of migratory bird species listed under EPBC Act may be present in proximity to the Proposal area. A search of the EPBC Act Protected Matters database within the area 20°34'S 116°50'E, 20°43'S 116°46'E and 20°45'S 117°30'E (with a 25m buffer from each boundary) was used to identify bird species listed under the EPBC Act likely to occur in the Proposal area. These species are listed in Table 20.3 below.

Of the 37 species listed as migratory under the EPBC Act and identified as potentially occurring within the Proposal area, one (*Macronectes giganteus*) is listed as Endangered. Field surveys between October 2008 and October 2010 confirmed 24 of these species as being present within the Proposal area (Supporting Studies 13.1 and 13.2; Table 20.3)

Table 20.3 Bird species listed as Migratory under the EPBC Act present or likely to be present in the Anketell Point region

Scientific Name	Common Name	EPBC Listing Status	Database search/field survey result.
Threatened Species			
<i>Macronectes giganteus</i>	Southern Giant-Petrel	Endangered	Species or species habitat may occur within area.
Migratory Terrestrial Species			
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory	This species was recorded in the study area.
<i>Hirundo rustica</i>	Barn Swallow	Migratory	Species or species habitat may occur within area.
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory	This species was recorded in the study area.
Migratory Wetland Species			
<i>Actitis hypoleucos</i>	Common Sandpiper	Migratory	This species was recorded in the study area.

Scientific Name	Common Name	EPBC Listing Status	Database search/field survey result.
<i>Ardea alba</i>	Great Egret, White Egret	Migratory	This species was recorded in the study area
<i>Ardea ibis</i>	Cattle Egret	Migratory	This species was recorded in the study area
<i>Arenaria interpres</i>	Ruddy Turnstone	Migratory	This species was recorded in the study area.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Migratory	Species or species habitat known to occur within area.
<i>Calidris alba</i>	Sanderling	Migratory	This species was recorded in the study area.
<i>Calidris canutus</i>	Red Knot, Knot	Migratory	This species was recorded in the study area.
<i>Calidris ferruginea</i>	Curlew Sandpiper	Migratory	This species was recorded in the study area.
<i>Calidris ruficollis</i>	Red-necked Stint	Migratory	This species was recorded in the study area.
<i>Calidris tenuirostris</i>	Great Knot	Migratory	This species was recorded in the study area.
<i>Charadrius leschenaultii</i>	Greater Sand Plover, Large Sand Plover	Migratory	This species was recorded in the study area.
<i>Charadrius mongolus</i>	Lesser Sand Plover, Mongolian Plover	Migratory	This species was recorded in the study area.
<i>Charadrius veredus</i>	Oriental Plover, Oriental Dotterel	Migratory	This species was recorded in the study area.
<i>Egretta sacra</i>	Eastern Reef Egret	Migratory	This species was recorded in the study area
<i>Glareola maldivarum</i>	Oriental Pratincole	Migratory	This species was recorded in the study area.
<i>Tringa brevipes</i>	Grey-tailed Tattler	Migratory	This species was recorded in the study area.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	Migratory	Species or species habitat known to occur within area.
<i>Limosa lapponica</i>	Bar-tailed Godwit	Migratory	This species was recorded in the study area.
<i>Limosa limosa</i>	Black-tailed Godwit	Migratory	Species or species habitat may occur within area.
<i>Numenius madagascariensis</i>	Eastern Curlew	Migratory	This species was recorded in the study area.
<i>Numenius phaeopus</i>	Whimbrel	Migratory	This species was recorded in the study area.
<i>Pluvialis fulva</i>	Pacific Golden Plover	Migratory	This species was recorded in the study area.
<i>Pluvialis squatarola</i>	Grey Plover	Migratory	This species was recorded in the study area.
<i>Tringa stagnatilis</i>	Marsh Sandpiper, Little Greenshank	Migratory	Species or species habitat may occur within area.

Scientific Name	Common Name	EPBC Listing Status	Database search/field survey result.
<i>Tringa nebularia</i>	Common Greenshank, Greenshank	Migratory	This species was recorded in the study area.
<i>Xenus cinereus</i>	Terek Sandpiper	Migratory	This species was recorded in the study area.
Migratory Marine Birds			
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory	Species or species habitat may occur within area.
<i>Puffinus pacificus</i>	Wedge-tailed Shearwater	Migratory	Breeding known to occur within area.
<i>Sterna albitrons</i>	Little Tern	Migratory	This species was recorded in the study area.
<i>Sterna anaethetus</i>	Bridled Tern	Migratory	Breeding known to occur within area.
<i>Sterna caspia</i>	Caspian Tern	Migratory	This species was recorded in the study area.
Other Species Protected by the EPBC Act			
<i>Calidris subminuta</i>	Long-toed Stint	Migratory - overfly marine area	Species or species habitat known to occur within area.
<i>Pandion haliaetus</i>	Osprey	Migratory	This species was recorded in the study area.
<i>Phalaropus lobatus</i>	Red-necked Phalarope	Migratory	Species or species habitat known to occur within area.
<i>Tringa totanus</i>	Common Redshank, Redshank	Migratory - overfly marine area	Species or species habitat known to occur within area.

Source: EPBC Act online Protected Matters Search Tool and results of Supporting Study 13.1 and 13.2 (<http://www.environment.gov.au/erin/ert/epbc/index.html> accessed 1 July 2010..

An additional 2 bird species listed as migratory under the EPBC Act, not listed by the Online Protected Matters Search Tool were also recorded during Supporting Studies 13.1 and 13.2. These were the Lesser Crested Tern (*Sterna bengalensis*) and Wood Sandpiper (*Tringa glareola*). Overall 31 bird species listed as Migratory under the EPBC Act have been confirmed from within the Proposal area. None of the species recorded are considered rare or threatened. No conservation significant avifauna were recorded from within the study area, although the Eastern Curlew is listed as a Priority Four species.

Important Bird Areas (IBAs)

Important Bird Areas (IBAs) are sites that regularly support >1% of an estimated global population of a species of avifauna (Supporting Study 13.2). These areas do not have legislative protection. The IBA process is a scientific method of identifying sites that are important for bird conservation. The IBA 1% criteria has been used to determine whether the Anketell Point area supports a significant number of any migratory bird species.

Recent systematic field surveys (October 2010) indicate that the Proposal area supports more than 1% of the estimated population (according to IBA criteria) of the Grey-tailed Tattler (*Tringa brevipes*, Supporting Study 13.2).

Breeding season counts were also relatively high for the Greater Sand Plover (*Charadrius leschenaultii*) and the Red-necked Stint (*Calidris ruficollis*), though numbers were below 0.5% of their estimated global population for both species (Supporting Study 13.2). Population counts for the remaining EPBC Act listed bird species were low and much less than the 1% IBA threshold.

Roosting sites

Other than for Grey-tailed Tattler, the proposal area did not contain any significant roosts for littoral birds or migratory waders on southward migration (see Spring Shorebird Survey in Appendix A of Supporting Study 13.2). The totals for individual species throughout the Proposal area were very small proportions of the global populations for each species. Large (>100 birds) roosts in the study area occurred at the north-eastern tip of Dixon Island, the south western end of Dixon Island, and on a small island east of Anketell Point (Figure 20.4).

During the 2010 southward migration season (October), the greater Anketell Point region supported a population of Grey-tailed Tattler with a total of 662 birds recorded roosting at high tide with the majority present at two key roosting sites: an area on mudflats south-west of Anketell Point and the south-west end of Dixon Island. The broader distribution of the Grey-tailed Tattler throughout the Nickol Bay region is not known.

Foraging surveys

The area did not generally contain significant numbers of foraging bird species, including those listed under the EPBC Act. The totals for individual species throughout the study area were small proportions of the global populations of each species (see Winter (Breeding Season) Shorebird Survey in Appendix A of Supporting Study 13.2). The vast majority of foraging birds were observed on mudflats south west of the proposed footprint for Anketell Port. During the 2010 southward migration season (October), the greater Anketell Point region supported a population of 500 Grey-tailed Tattlers recorded foraging at low tide, with the majority present on mudflats within Bouguer Passage.

20.4.3 Terrestrial species

Flora and Vegetation

A search of the EPBC Act database did not identify any listed flora species or threatened ecological communities as potentially occurring in the Proposal area. Level 2 flora and vegetation assessments undertaken in accordance with EPA Guidance Statement No. 51 (EPA, 2004c) did not record any EPBC Act listed species or ecological communities in the Proposal area.

The surveys recorded 207 species from 97 genera and 41 families, comprised of 204 species native and three introduced (Supporting Study 12.1). The most frequently recorded species were from the:

- Poaceae (grasses – 38 species)
- Papilionaceae (pea family – 28 species)
- Malvaceae (hibiscus family – 17 species).

This representation of taxa is typical for the Pilbara region (refer Section 12).

Fauna

A number of terrestrial fauna species listed as Threatened under the EPBC Act may be present in proximity to the Proposal area, as identified by the EPBC Act Protected Matters Search Tool (Table 20.4). Expert advice to API (Phoenix Environmental Services) suggests a number of species identified in the database search are unlikely to occur in the proposal area.

Table 20.4 Terrestrial fauna species listed as Threatened under the EPBC Act present or likely to be present in the Anketell Point region

Scientific Name	Common Name	EPBC Listing Status	Type of Presence in Area
<i>Rhinonictis aurantius</i> * (Pilbara form)	Pilbara leaf-nosed bat	Vulnerable	Species or species habitat likely to occur in area.
<i>Dasyercus cristicauda</i> *	Mulgara	Vulnerable	Species or species habitat likely to occur in area.
<i>Dasyurus hallucatus</i>	Northern quoll	Endangered	Species or species habitat likely to occur in area.
<i>Liasis olivaceus barroni</i> *	Pilbara olive python	Vulnerable	Species or species habitat may to occur in area.

Scientific Name	Common Name	EPBC Listing Status	Type of Presence in Area
<i>Lagostrophus fasciatus fasciatus*</i>	Banded hare-wallaby	Vulnerable	Species or species habitat may occur within area.
<i>Milyeringa veritas</i>	Blind gudgeon	Vulnerable	Species or species habitat may occur within area.

Note:*Species reported as unlikely to occur within the Proposal area (Pheonix Environmental Services).

Pilbara Leaf-nosed Bat (Rhinonictis aurantius) (Pilbara form)

The Pilbara leaf-nosed bat is endemic to Australia and has a range stretching from the Pilbara to Queensland. The Pilbara form is restricted to the Pilbara region where it roosts in caves and mine adits with stable, warm and humid microclimates (Armstrong, 2001). Limited suitable habitats combined with its poor ability to maintain heat and water balance are the most important factors threatening the survival of this species (Baudinette et al. 2000).

It is unlikely this species occurs within the Proposal area (Supporting Study 13.1). Despite intensive Anabat recordings during Supporting Study 13.1 and those by Biota (2008a) and Ninox (2008), this species was not recorded. No suitable year round roosting habitats (e.g. deep caves/mine shafts) for this species were observed during the surveys conducted as part of Supporting Study 13.1.

Mulgara (Dasyercus cristicauda)

The mulgara is a dasyurid marsupial occurring in the arid areas of Australia. Records in WA are from the Great Victoria Desert, Goldfields, Gascoyne, Sandy Desert and Pilbara regions. It is most frequently found in habitats dominated by mature spinifex (*Triodia* spp.) and lives in burrows that it digs on the flats between low sands dunes (Woolley, 2008; Baker, 1996). According to Maxwell et. al. (1996), the mulgara has declined over 50 – 90% of its original range. Recent revisions of *Dasyercus* resulted in the predominantly Western Australian populations of *D. cristicauda* being classified as a separate species, *D. blythi* (Brush-tailed Mulgara), primarily based on tail morphology (Woolley, 2008). Based on the known distributions of the two species, it is assumed that the listing of *D. cristicauda* from the database searches refers to *D. blythi*.

The nearest documented record is approximately 200km east of the study area in sandy arid regions. It is considered unlikely that this species occurs within the Proposal area (Supporting Study 13.1).

Northern Quoll (Dasyurus hallucatus)

The original distribution of the northern quoll extended across Northern Australia from the Northwest Cape, Western Australia to south-east Queensland. Its distribution is now restricted to six main areas: the north and western top end of the Northern Territory, north of Cape York, the Atherton-Cairns area, the Carnarvon Range-Bowen area of Queensland (Menkhorst and Knight 2001), and the northwest Kimberley and Pilbara regions of Western Australia (Braithwaite and Griffiths 1994). It also occurs on numerous islands off the Australian coast (Abbott and Burbidge 1995; Burbidge and McKenzie 1978). The northern quoll's preferred habitat is broken, rocky country and open eucalyptus forest within 150km of the coast (Strahan 2004). Small mammals, reptiles, worms, insects, honey and soft fruits constitute its main diet (Strahan 2004).

It is possible that the northern quoll occurs within the Proposal area. Ninox (2008) recorded the distinctive footprints of the northern quoll in sand on the west side of Dixon Island. The most recent recorded capture of the species in the general area is dated 1986 (DEC database search in Biota 2008a). The northern quoll is a habitat generalist, and therefore, it may occur almost anywhere within the Proposal area, but is most likely to occur on the rocky tors and associated rocky hillslopes inland of the proposed disturbance envelope (Supporting Study 13.1). The Proposal area itself on Dixon Island contains low-elevation *Triodia* sp. and *Cenchrus ciliaris* hummock grasslands, and no core habitat for the species appears to be present (Biota, 2009).

Pilbara Olive Python (Liasis olivaceus barroni)

The Pilbara olive python occurs in rocky areas within the Pilbara, showing a preference for rocky habitats near water, particularly rock pools. It is primarily found in gorges and dissected drainage lines, and is restricted to the Pilbara and Gascoyne regions occurring in the Burrup Peninsula, Ord Ranges and Meentheena south to Nanutarra and Newman (Storr et al., 2002).

No evidence was recorded to suggest that the Pilbara olive python occurs within the study area (Supporting Study 13.1). Habitat within the study area is unsuitable or at best marginal for this species. The lack of historical records also suggests the species does not inhabit the area.

Banded Hare-wallaby (Lagostrophus fasciatus fasciatus)

This subspecies of the banded hare-wallaby only occurs naturally on Bernier and Dorre Islands at Shark Bay. Attempts are being made to reintroduce it to Peron Peninsula. The mainland form, *Lagostrophus fasciatus albigilis*, is extinct.

The DEC database search indicates that this species has been recorded at Cossack though no date is provided for the observation. It is assumed that the record is actually of the mainland subspecies and that it is not very recent. It is highly unlikely that this species occurs within the Proposal area.

Subterranean Fauna

Blind Gudgeon (Milyeringa veritas)

This species is known to occur on the Cape Range Peninsula in the arid north-west of WA (Humphreys & Feinberg, 1995) and at Barrow Island to the north-east of the Cape Range Peninsula, off the WA coastline (Humphreys, 1999).

The geology of the Anketell Point Proposal area is not conducive to occurrence of the fish as it requires a karstic habitat with relatively open subterranean spaces (due to ranging up to 4.5 cm in length). Anketell Point consists of tidal mudflats, and low sand dunes overlying basalt (Phoenix 2010). While the sand dunes may contain a small perched freshwater aquifer, the karstic habitat the fish require does not occur within the dunes (S. Halse 2010, pers. comm.).

If the species does occur on the Pilbara Coastal Plain outside of the Cape Range Peninsula or Barrow Island, it is likely to be restricted to a narrow band of habitat near the coast in the lower Robe and Fortescue river basins where typical prey species such as *Stygocaris* sp. and *Haptolana yarraloola* have been recorded. Anketell Point appears to be unsuitable for the blind gudgeon, based on the underlying geology. This is supported by the observation that no stygofauna with affinities to the fish or similar habitat have been recorded within 20 km of Anketell Point (Bennelongia Environmental Consulting, 2010).

20.5 IMPACT ASSESSMENT

20.5.1 Marine species

The main potential impacts to marine mammals and turtles associated with the Proposal discussed in detail in Section 9 of the PER/draft PER are as follows:

- Underwater noise emissions during piling activities;
- Impacts on turtle nesting from light spill;
- Impacts on turtle nesting from altered coastal processes;
- Impacts due to the desalination plant discharge;
- Entrainment of marine turtles within the intake of the trailing suction hopper dredges; and
- Surface strikes on marine mammals and turtles by vessels.

Potential impacts on marine fauna associated with hydrocarbon spills are addressed separately in Section 11 of the PER/draft PER.

The main potential impacts of the Proposal on the migratory and threatened marine species recorded within the Proposal area are discussed in summary below, by species. There more detailed analysis is described in Section 9.

Humpback whale (*Megaptera novaeangliae*)

Impacts on the humpback whale may occur during piling operations as a result of underwater noise generation. The zone of possible physical injury surrounding the piling operation is relatively small (see Figure 9.2), and it is expected that whales will not enter this area once piling operations have commenced. It has been noted in previous investigations that given the relatively short duration and range of displacement of migratory animals around seismic activity, a low risk was posed by such activity (McCauley *et al.*, 2000). Pile driving inshore at eastern Dixon Island is similarly likely to cause a short range displacement of passing whales, with animals exposed for a short time while passing the proposed wharf site where piling will be undertaken.

Cow/calf pairs were observed resting/milling within Nickol Bay during the southern migration (Supporting Study 9.1), although data obtained to date suggests that the value of Nickol Bay as a resting area is significantly less than that of other recognised resting areas such as Shark Bay and Exmouth Gulf (CWR, unpublished data). The results of the initial vessel-based survey, to investigate the significance of Nickol Bay as a resting area, will be included

within the Supplementary PER to be submitted under the EPBC Act process. Resting/milling cows and calves are potentially more sensitive to underwater noise impacts than actively migrating individuals (McCauley *et al.*, 2000). Modelling indicated that marine mammals could potentially exhibit avoidance within approximately 3-4 km of the piling operations (based on a conservative threshold of 120 dB re $1\mu\text{Pa}^2\cdot\text{s}$ (SEL)) No whales were recorded within close proximity to the proposed wharf site (one whale came within 1.4 km of the wharf site and four came within 4.5 km, Supporting Study 9.1), and the proposed piling activity is not expected to prevent cows/calves from entering Nickol Bay, which they currently do from the east and northeast, generally passing > 4.5 km north of the wharf. In addition, the sound exposure level from piling will rapidly decrease with distance from the source, resulting in very low levels within Nickol Bay where the majority of the potential resting/milling activity was recorded (Figure 3.11). A vessel-based research programme is underway to enable validation of predictions made regarding the avoidance of underwater noise sources by marine mammals during construction (refer to Marine Fauna Management Plan in Appendix 3). Baseline monitoring of ambient underwater noise (including any current anthropogenic noise) will be undertaken using loggers deployed on the seabed at a number of sites within the Proposal area, including within Nickol Bay. Results from these surveys will be included within the Supplementary PER to be submitted under the EPBC Act process.

Impacts associated with underwater noise generated during dredging or vessel movements, including ore carriers, are also possible, but are likely to be limited to avoidance behaviour within the immediate vicinity of the noise sources (refer to Section 9.3.2 for more details). Vessels moving along a defined dredged port access channel will be distant (> 20 km) from the north west sector of Nickol Bay that exhibited higher densities of milling whales. A research programme is underway to enable validation of predictions made regarding the avoidance of underwater noise sources by marine mammals during construction (refer to Marine Fauna Management Plan in Appendix 3).

Surface strikes by construction and operational vessels may occur as a result of the Proposal. The number of vessels and the abundance of whales moving within or through the area will influence the potential frequency of strikes. Interactions between vessels and whales are most likely to occur during the southern migration (peak period August to October) due to the small majority of humpback whales sighted during the southern migration resting/milling in the north west region of Nickol Bay. Resting/milling whales are most at risk of adverse vessel interaction due to their inability to rapidly alter course (Vanderlaan and Taggart, 2007). Laist *et al.* (2001) has indicated that all sizes and types of vessels can hit whales. However, the most lethal and severe injuries are caused by vessels greater than 80 m in length travelling at speeds of 14 knots or faster.

The speed of bulk carriers within the shipping channel will range from 8 to 12 knots, slowing to 4 knots near the wharf. The trailer suction hopper dredge will operate at a speed of 1 to 3 knots while dredging and up to 14 knots when travelling between the dredge area and the dredge material disposal areas.

The risk of whale strike during construction and operational phases of the Proposal are considered to be low and manageable for the following reasons:

- ore carriers and will travel at low speeds (up to 12 knots) within the dredged shipping channel (17.5 km from wharfs);
- marine mammals are likely to hear approaching vessels at some distance, providing the opportunity for avoidance;
- construction vessel operators and crew will undergo an induction that will include such topics as marine fauna observations and monitoring and details of procedures to be followed to avoid collisions;
- API will adhere to EPBC regulations which specify implementation of a 'caution zone' of 300 m and a no approach zone of 100 m around whales;
- skippers/pilots will be take practical steps (such as slowing the vessel down), without compromising the safety of the vessel and crew, to avoid collisions with whales;
- marine fauna observations will take place during dredging operations for a 1.5 km line of sight around the vessel;
- dredging or disposal operations will not be commenced if marine mammals are observed within a 300 m radius of the dredge, dredge operations will be suspended if marine mammals are observed within a 100 m radius of the dredge; and
- bulk ore vessel pilots will be kept informed of the location of whales in the Proposal area.

To put the API proposed operational shipping (ore carriers) movement (~175 per annum for 30 mtpa iron ore exports up to 670 per annum for 115 mtpa) into context, over 11,374 ships arrived at ports in Western Australia during the 2009 calendar year (AMSA 2010b). The busiest ports included; Dampier (4007 ships), Port Hedland (1214 ships), Fremantle (1847 ships) and Broome (1376 ships). Humpback whales are known to pass through waters used

by vessels moving into and out of these ports. Given that the current Port of Dampier (~40 km west of Anketell Point) vessel traffic volume is more than 20 times that proposed at Anketell Point Port (at 30 mtpa), and very few collisions are reported, it is intuitive that whale/vessel interactions do not commonly occur. Further examination of the likely rates of cetacean-vessel co-occurrence was included in Section 9. Numerical estimates of co-occurrence, based on known whale occurrences and shipping levels for the proposed (and potential future) port and derivations of IWC records, indicate that expected vessel strikes for the proposed port are in the order of one 'strike' every three to 30 years (at 30 mtpa), and in the order of one 'strike' every two to ten years of operation.

No impacts to this species are expected as a result of the desalination plant discharge. During 12 months of aerial surveys, no whales were recorded in close proximity (< 1 km) to the proposed desalination discharge location (one whale came within 1.4 km of the discharge location and four came within 4.5 km, Supporting Study 9.1) and it is thought that relatively shallow water depths cause southerly migrating whales to swim west or northwest, having passed Point Samson and Cape Lambert, until they enter Nickol Bay (C. Jenner 2010, pers. comm.). No migrating whales are expected to be impacted by the proposed desalination plant discharge given that the predicted increase in salinity of 0.5 PSU within 25 m of the discharge location is within natural variation.

Bryde's whale (*Balaenoptera edeni*) and false killer whale (*Pseudorca crassidens*)

Both species were recorded in low numbers during the aerial surveys, well offshore of the proposed shipping channel (Supporting Study 9.1). Given the separation from the Proposal area, the risk of impact to these species is considered negligible.

Indo-Pacific humpbacked dolphin (*Sousa chinensis*) and spotted bottlenose dolphin (*Tursiops aduncus*)

Impacts on dolphins may occur during the piling operation as a result of underwater noise generation. The zone of possible physical injury surrounding the piling operation is relatively small (see Figure 9.2), and it is expected that dolphins will not enter this area once piling operations have commenced.

It is not expected that increased turbidity will negatively impact dolphins as they are able to avoid vessels and are able to feed within turbid waters using echolocation. The potential for impacts to marine mammals, including dolphins, from the proposed desalination plant discharge was determined to be negligible (refer to Section 9.3.2).

Dolphins are commonly observed within busy port areas, and are often observed riding the bow waves of large vessels (C. Jenner 2010, pers. comm.), indicating that they are able to detect and avoid (or seek out) such vessels, and are unlikely to be harmed by the noise levels produced. Impacts are more likely to occur as a result of fast moving small recreational vessels and discarded recreational or commercial fishing gear (C. Jenner 2010, pers. comm.).

No significant direct (e.g. physical impacts or displacement due to underwater noise) or indirect impacts (e.g. loss of food resources) to dolphins are expected (refer to Section 9 for further details).

While the dolphin data obtained to date does not provide a reliable assessment as to the existence of resident populations in proximity to the Proposal area, it is understood that resident populations commonly occur along the West Australian coastline. Resident populations in other areas of Western Australia are observed to exist alongside intensive commercial shipping operations. No significant impact on local dolphin populations, as a consequence of construction or operations of the Proposal, is expected.

Flatback turtle (*Natator depressus*), hawksbill turtle (*Eretmochelys imbricata*) and green turtle (*Chelonia mydas*)

Marine turtles nest in small numbers on Dixon Island (primarily flatback turtles and some hawksbill turtles) and forage in mangrove areas in Bouguer Passage (primarily juvenile green turtles) adjacent to the Proposal area. The Proposal has the potential to impact nesting adult flatback and hawksbill turtles and hatchlings and juvenile green turtles. Noise and vibration from pile driving are unlikely to cause harm to nesting turtles at Dixon Island.

As discussed within Section 9, blasting will be undertaken where possibly outside of the turtle nesting season. When blasting is required during the nesting period, it will be managed to minimise potential impacts to turtle nesting, principally through the following measures:

- Timing;
- Blasting direction;
- Blast intensity; and

- Blasting technology.

Noting the limited available scientific data in relation to blast vibration impacts to turtle nesting and hatching success, API will conduct a monitoring programme, as a part of the Marine Fauna Management Plan (refer Appendix 3 of the PER/draft PER), that will collect nesting data, which, combined with vibration information, may increase the scientific knowledge on this issue.

Artificial light will be designed and controlled so that light of wavelengths least disruptive to turtles is used and lighting is low and directional thereby reducing light spill.

Dredging of the berth pockets and shipping channel, and construction of the load-out causeway and tug harbour on Dixon Island, has the potential to alter local wave and current patterns, potentially leading to shoreline change of the beaches west of the load out causeway. The impacts on the morphology of these beaches, which are used by turtles for nesting, are predicted to be very minor (Supporting Study 9.4).

Surface strikes on turtles by construction and operational vessels may occur as a result of the Proposal. The number of vessels and the abundance of fauna moving within or through the area will influence the potential frequency of strikes. The broad frequency spectrum of vessel noise (Richardson *et al.*, 1995) overlaps the relatively low auditory range of turtles (Ketten and Bartol, 2006). The range is 100-500 Hz for adult turtles and 100 – 800 Hz for juveniles (Ridgeway *et al.* 1969, Bartol, 2007) with sensitivity decreasing with age. Turtles are expected to hear and avoid vessels. In addition, vessels associated with the Proposal (other than those involved in ongoing scientific studies) are not expected to operate within 3 km of Delambre Island, which has been identified as a significant turtle nesting location. Therefore, impacts on major aggregations of turtles or on nesting turtles, are not expected. Potential turtle food sources (see Section 9.3.2) are generally located away from the predicted vessel routes (see Section 9.3.2), so significant impacts on foraging turtles are not expected.

Modifications to the trailing suction hopper dredges will be made to minimise the risk of turtle entrainment during dredging. At a recent “Turtles & Dredging” workshop (held by DEC in October 2009), it was generally agreed that observations on dredges for turtles were not useful, as visible turtles near the sea surface are not at risk of entrainment

API proposes to construct a solid rock causeway (the Anketell Point-Dixon Island causeway) with a temporary (up to six months) low-level deviation around the bridge site across Bouguer Passage. The effect is that an area adjacent to the western side of the solid causeway will remain inundated to a level approximately equal to mean sea level (water depth of ~2 m). Although any turtles foraging within Bouguer Passage at high tide are likely to follow the ebb tide out (to the west) of the Passage, there is potential for marine fauna, including turtles, to be ‘trapped’ within this area during low tide. Any marine fauna remaining within the ‘inundation area’ would only be isolated (by an area of shallow water) from open water for a short time, until the flood tide reconnects this area (see Section 9 for detailed analysis). No significant impacts on turtles are expected.

The closest BPPH or filter feeder community to the proposed desalination discharge is hard coral habitat, which is located over 500 m inshore of the discharge location and is unlikely to be affected. Refer to the Desalination Plant Discharge Management Plan (Appendix 3) for details of the proposed water quality monitoring programme.

API has committed to designing the desalination plant intake to incorporate a screen that is smaller than the size of a turtle hatchling, and to ensure that the intake velocity remains below 0.15 m/s, which is the recommended maximum intake velocity to ensure protection of 96% of fish species (US EPA, 2001). The potential for impacts to marine turtles from the proposed desalination plant discharge or from potential entrainment of juveniles into the desalination plant was determined to be negligible (refer to Section 9.3.2).

As Dixon Island is not a significant nesting location compared with other locations throughout the Dampier Archipelago (Section 3.3.9), it is unlikely that any impacts arising from the Proposal will significantly affect regional turtle populations.

Green sawfish (*Pristis zijsron*)

Habitat loss has the greatest potential to impact this species, with direct impacts unlikely. As the risk of impact to BPPH and mangroves is relatively minor (see Chapters 7 and 8), any significant indirect impacts are considered unlikely.

20.5.2 Avifauna

The following environmental aspects associated with the port development may potentially affect a number of EPBC Act listed bird species and associated habitats:

- vegetation clearing for the Proposal will result in the direct loss of potential migratory/marine bird habitat areas;
- construction and operations activities may result in indirect habitat modification through changes to the hydrology of tidal areas;
- light spill and noise emissions may alter fauna behaviour; and
- hydrocarbon spills.

Impacts that may arise from these environmental aspects include:

- reduction in, and decline of habitat;
- displacement and alteration to behaviour and moving patterns;
- ecological effects from altered behaviour or displacement;
- increased predation or competition; and
- mortality or injury.

Assessment of the potential impacts on the broad assemblage of recorded bird species is presented below, followed by a more specific evaluation of the potential impacts of the proposal on the Grey-tailed Tattler, given the relative abundance of this species recorded in the Proposal area.

Direct habitat loss

Important habitat for a migratory species can include areas that are only used occasionally or periodically, but support an ecologically significant proportion of the population. In the case of migratory birds (shorebirds in particular), this can include sites that are utilised during one or more of the breeding or non-breeding seasons, or as a staging area during northward or southward migration (see Winter (Breeding Season) Shorebird Survey in Appendix A of Supporting Study 13.2). Section 13.3.2 details the estimation of proportion of each habitat type loss across the Proposal area.

API has minimised the area of relatively higher value avifauna habitat, such as mangroves and intertidal areas that falls within the Proposal envelope. Based on land system units, the principal habitat utilised by migratory bird species within the Proposal is the Littoral land system. The proportion loss of this land system at a regional scale is negligible and relates to 0.1% loss in the Pilbara Bioregion (Table 20.6).

Ground disturbance controls will be implemented to ensure that clearing is limited to the designed Proposal footprint.

Construction and operations

The locations of migratory bird roosts in the Proposal area are shown in Figure 20.4. Several smaller-size class roosts are present on Anketell Point and the north eastern end of Dixon Island. It is likely that migratory birds utilising these will be displaced once Proposal construction commences. The largest roosts recorded (at the southwest end of Dixon Island and on the smaller island to the east of Anketell Point; see Figure 20.4) would not be impacted directly through habitat loss.

Noise impacts

Supporting Study 18.1 (Appendix 1) modelled predicted noise levels for the Proposal, and these are overlain on the locations of recorded migratory wader roosts on Figure 20.4. There are no quantitative noise levels that can be reliably used to determine changes in bird behaviour across the range of species recorded from the Proposal area. It is possible that increased noise levels could lead to reduced usage of roost sites closer to the Proposal, particularly those on Anketell Point within the 50 dB contour (see Figure 20.5). Observational evidence from other Pilbara locations suggests that many species can become habituated to increased noise levels (e.g., at port operations in similar habitats at Finucane Island at Port Hedland) (Supporting Study 18.1).

A similar suite of littoral bird species has been recorded utilising habitats a similar distance from the existing Cape Lambert port operations, and this usage persists in a similarly heightened noise environment Biota (2008a). While short-term behavioural changes and displacement could occur, it is probable that the majority of bird species utilising the largest roost sites (101 to 500 and more than 500 roost class sites) will continue to utilise these habitats.

Light impacts

The construction and operation of the Proposal will lead to an increase in light levels in immediately adjacent habitats and artificial light emissions have the potential to affect migratory waders through two broad mechanisms: behavioural disturbance and disorientation (Supporting Study 13.2).

Migratory waders are adapted to natural changes associated with the day and night cycle as well as the night-time phase of the moon. Artificial lighting has the potential to create a constant level of light at night that can reverse these natural levels and cycles, thus affecting behaviour. Migratory waders may also use lighting from natural sources to orient themselves during migration in a certain direction at night. In instances where an artificial light source is brighter than a natural source, the artificial light may act to override natural cues leading to disorientation.

Artificial light may influence communications and foraging behaviours. A study of roosting sites at Roebuck Bay WA found that migratory waders typically avoid roosting sites that are exposed to sources of artificial lighting, as the light is likely to increase detection of the waders by predators (Rogers *et al.*, 2006). Furthermore, it is suggested that lights may cause either disorientation or attraction, causing injury or mortality if they fly into structures (Bamford, 2005). A study by Rogers *et al.* (2006) concluded that “feeding areas are only of use to waders if they are associated with acceptable roosts”. The impacts of direct disturbance and increased noise on bird roosts at or near Anketell Point (see Figure 20.4) are likely to supersede any changes in increased light levels in regard to migratory waders in these proximal locations. Light management measures will be implemented to minimise the impact of light spill from the Proposal on adjacent undisturbed roosting areas.

Hydrology and intertidal sand and mudflats

Migratory waders, use the archipelago’s beaches and mudflats as feeding and resting sites during their long flights between Australia and their breeding grounds in Siberia and Alaska (Tingay and Tingay, 1978). Intertidal sand and mudflats often associated with mangrove communities support a diverse range of infauna including crustaceans (e.g. fiddler crabs, soldier crabs) and molluscs (gastropods and bivalves). These intertidal areas are key feeding zones for waders during low tide (CALM, 2000).

Two extensive intertidal sand and mudflats are located in close proximity to the project area: Bouguer Passage, an intertidal flat between Dixon Island and the mainland, and an intertidal salt flat south of Anketell Point. In other parts of the survey area, dense mangrove communities line the upper intertidal zone of the mainland, while sandy beaches are scattered along the coastal fringe and islands.

Sandy beaches and shorelines provide a range of habitats critical to the survival of waders, from intertidal feeding grounds to roosting sites. Roosting sites in particular are typically near the high tide mark, on sandpits or open shores with clear visibility to avoid predation, free from disturbance, and within 5 – 10 km of foraging grounds (Finn *et al.*, 2002; Rogers *et al.*, 2006).

Based on survey data, part of the survey area constitutes habitat supporting significant populations of the Grey-tailed Tattler (see Spring (Southward Migration) Shorebird Survey in Appendix A of Supporting Study 13.2). Bouguer Passage consists of intertidal and soft sediment areas comprising both sand and mudflats. The area between Dixon Island and the mainland supports 1.32% of the estimated global population of Grey-tailed Tattlers on southward migration and possibly the northward migration. Impacts on Bouguer Passage will be minimised by appropriate causeway design that minimises changes to the existing tidal (and sediment transport) regimes (refer Section 8). Access to the tidalflats by the workforce (contractors and employees) will be controlled through the implementation of management measures, including inductions, access restrictions/procedures and signage.

Grey-tailed Tattler

Direct loss of habitat

Observations and records in 2010 have indicated that key roosting sites for the species are the mudflats on the south side of Bouguer Passage and the south-west and north-east of the Dixon Island shoreline. Two of these areas may be compromised as roosting sites due to presence or proximity of infrastructure development. No impact to the south-west Dixon Island roosting site is anticipated. In terms of roosting areas, the species may alternatively use mangroves, partly submerged rocks or beaches. After development, animals are likely to utilise other suitable roosting sites in the region, particularly those around the shoreline of Nickol Bay.

Key foraging habitats for the species appear to be intertidal sand and mudflats in close proximity to mangroves, particularly in the Bouguer Passage. Some of the mudflat area on the mainland west of the development will be lost to development, though the broader foraging habitat of the Bouguer Passage will remain undisturbed. Bouguer Channel and Nickol Bay consists of vast expanses of intertidal/soft sediment, including areas of sand and mudflats surrounded by mangroves. The majority of the channel and the entire Bay area was unsurveyed, so is likely to support extensive foraging habitats for Grey-tailed Tattlers.

Indirect effects

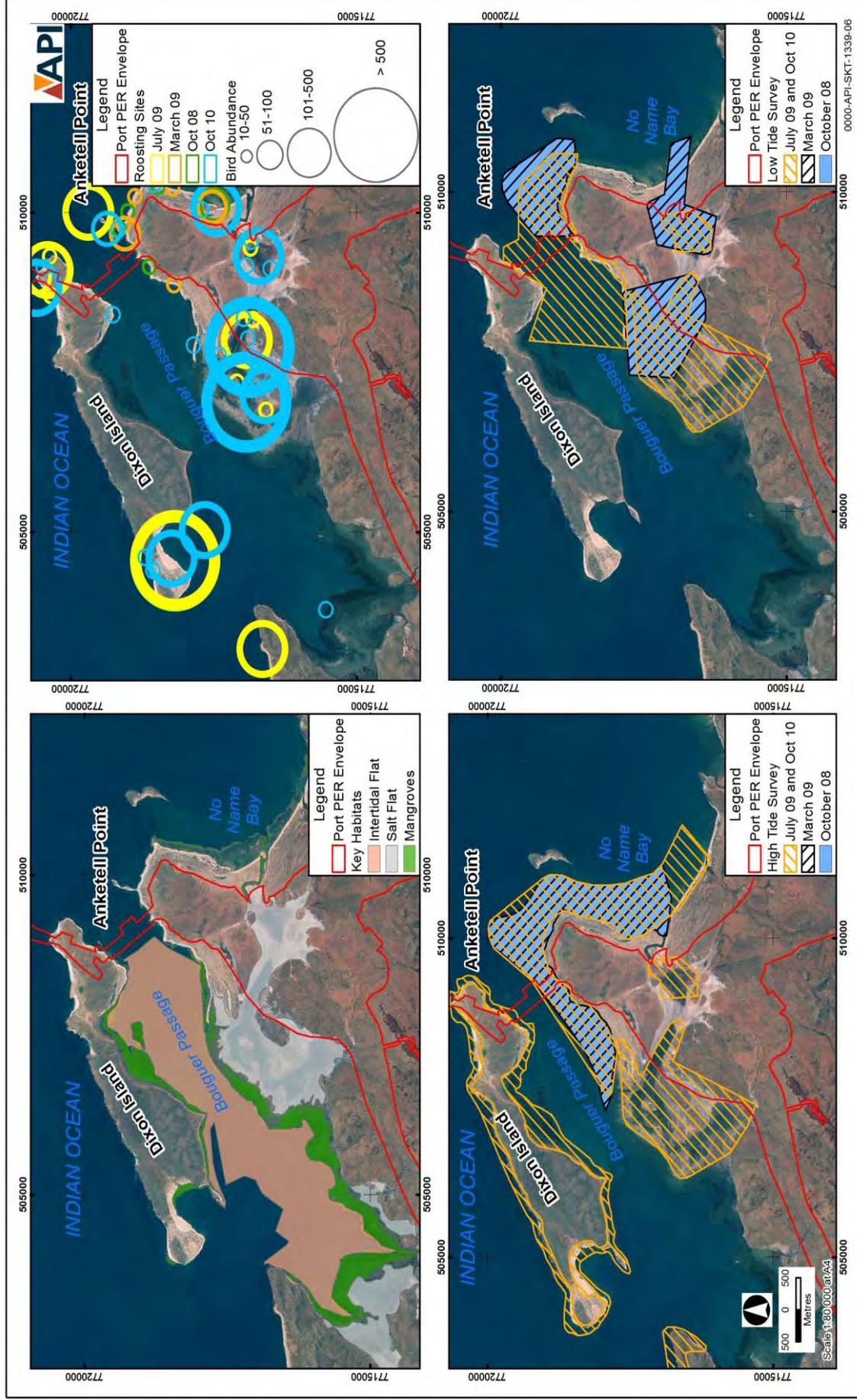
Artificial light emissions causing direct spill and skyglow have the potential to affect Grey-tailed Tattlers through two broad mechanisms: behavioural disturbance and disorientation. Noise is unlikely to transmit beyond a small zone of influence and birds are likely to acclimatise to a changed background noise environment, particularly where the noise levels are relatively constant.

Behaviour

Of the key roosting sites identified for Grey-tailed Tattlers, the two known areas that fall within the light spill zone will be primarily disturbed through direct port development. It is likely that species will move to other suitable roosting sites in the area so not prone to indirect light effects. It is unlikely that these current known roosting sites are critical to supporting the regional population of Grey-tailed Tattlers. To confirm this, regional assessment would need to be undertaken in the wider Nickol Bay region.

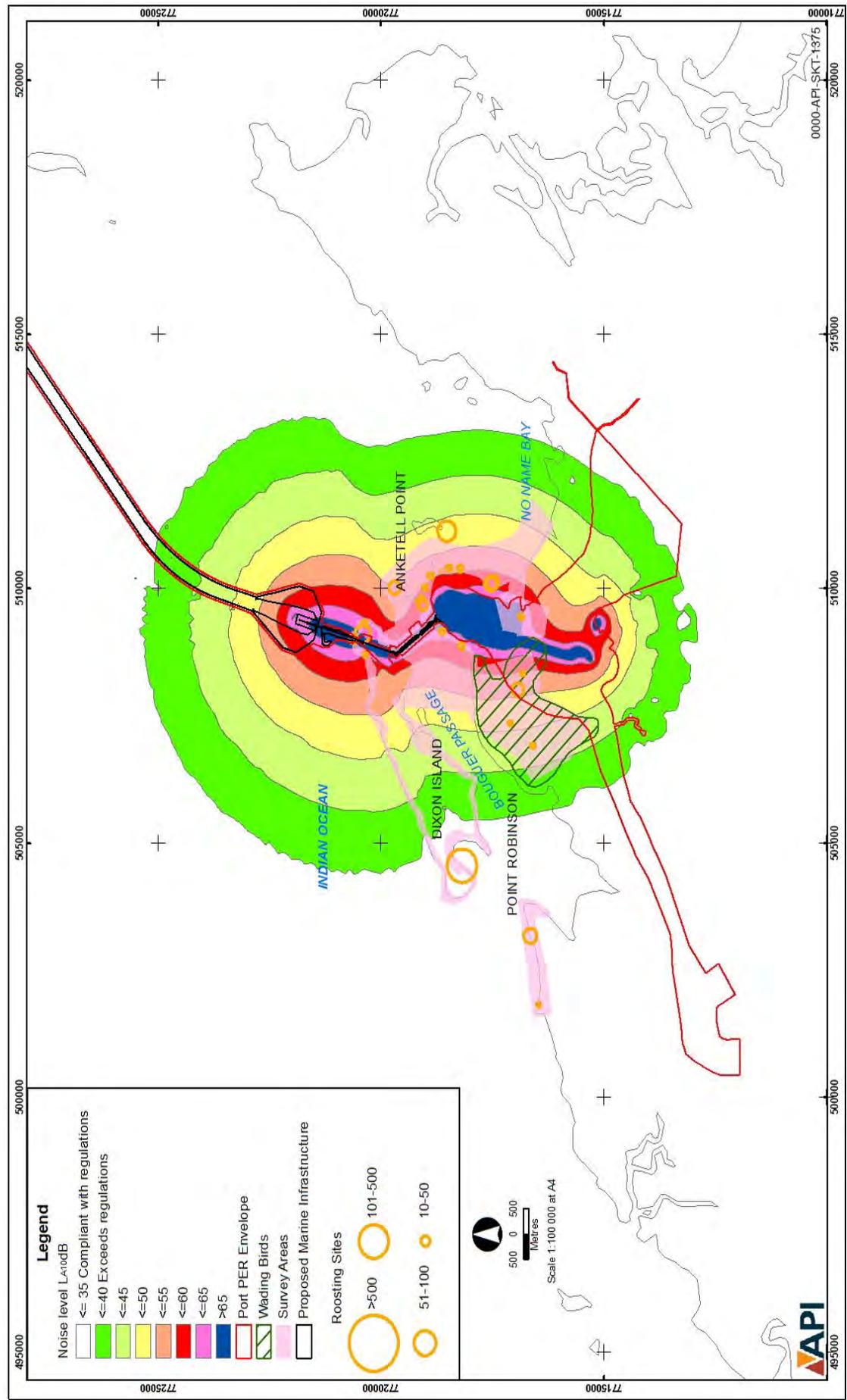
Disorientation

Artificial lighting at the proposed port has the potential to impact nearby Grey-tailed Tattler roosting or foraging sites, or disrupt the migration of waders past the site. This may increase the risk of wader collision with structures and exacerbate the depletion of energy reserves of the species through disorientation. However, Pilbara coastal region industry lighting emissions are not known to result in the attraction of migratory birds towards existing facilities. WEL (2006) stated that “during operations, flaring activities at night have the potential to attract seabirds and shorebirds, although potential impacts are considered minor” (Pluto LNG Development PER).



Data Source: Supporting Study 13.2

Figure 20.4 Location of migratory bird survey areas and approximate abundance recorded



Data Sources: Supporting Studies 132 and 18.1.

Figure 20.5 Location and relative size of migratory bird roost sites in relation to noise contours modelled for the Proposal

Spread of introduced (or feral) animals.

The intertidal nature of Bouger Passage enables the movement of fauna to and from Dixon Island. The construction of a causeway between Anketell Point and Dixon Island may facilitate movement of introduced fauna. Introduced fauna, in particular the fox, has been recorded on the island. Vegetation clearing, habitat disturbance and the construction of roads/tracks also has the potential to facilitate increased spread of introduced animals to the Proposal area. Feral fauna management measures will be implemented to minimise this risk.

Impact from physical barriers.

The physical presence of the causeway and other infrastructure may impact flight patterns of avifauna within the Proposal area, inadvertently leading to bird strike. The risk of any significant impact is low.

Hydrocarbon Leaks or Spills.

There is a risk of hydrocarbon leaks or spills from transport and storage of fuel, failure of plant and equipment, and storage and disposal of waste. Such incidents may result in smothering of fauna habitat, acute toxicity to habitat or fauna, and/or chronic toxicity to habitat or fauna. These risks will be minimised through the implementation of hydrocarbon management procedures (See Section 11 and the Oil Spill Contingency Plan in Appendix 3).

Off-road vehicle traffic and pedestrian movement

Without management, the Proposal could lead to an increase in pedestrian and off-road vehicular traffic, particularly during the construction phase. Access to areas outside of the Proposal footprint by the workforce, and potentially intrusive or disturbing activities will be regulated.

Summary of potential impacts on EPBC Act listed avifauna species within the Proposal Area

The significance of habitat within the Proposal area and the likely impacts of the Proposal on the 31 listed migratory bird species under the EPBC Act confirmed as occurring within the Proposal area are discussed in detail below (Table 20.5).

Table 20.5 Migratory and marine bird species listed under the EPBC Act present in the Anketell Point region

Species	EPBC listing status	Occurrence and significance of habitat
Bar-tailed godwit*** (<i>Limosa lapponica</i>)	Migratory/ Marine	<p>The bar-tailed godwit is a common migratory wader, inhabiting coastal mudflats, sandbars, estuaries and salt marshes.</p> <p>This species was commonly observed during Supporting Study 13.2, being more widespread at low tide and more restricted at high tide. Bar-tailed godwits were observed at the south end of Dixon Island during the June 2009 survey (Supporting Study 13.1), and recorded by Ninox (2008) on Dixon Island and Biota (2008a) on tidal flats at Cape Lambert.</p> <p>Despite this species being recorded as common to the Proposal area, and observed during northward and southward migrations and the breeding season, numbers did not exceed 0.06% of estimated global population during any of the bird surveys (Supporting Study 13.2). The potential for these species, or key habitat areas for these species, to be affected by the Proposal is low.</p>
Black-tailed godwit* (<i>Limosa limosa</i>)	Migratory/ Marine	<p>The black-tailed godwit is a commonly found, relatively slender shorebird that normally inhabits estuaries, sheltered bays, and lagoons with extensive tidal mudflats (Morcombe, 2004).</p> <p>A single individual was noted during Supporting Study 13.1. No significant impacts would be expected on this taxon as a result of the construction and operation of the Proposal.</p>

Species	EPBC listing status	Occurrence and significance of habitat
Caspian tern*** (<i>Sterna caspia</i>)	Migratory/ Marine	<p>The Caspian tern occurs along most of the WA coastline and throughout much of eastern Australia. Preferred habitats include sheltered estuaries, inlets, bays and lagoons with mudflats.</p> <p>During Supporting Study 13.1, small groups (2 or 3 individuals) of Caspian terns were observed on numerous occasions along the beaches on Dixon Island and the mainland. A breeding season survey indicated that the species was very common to the Proposal area with a total of 141 individuals being recorded at high tide. Caspian terns have also been recorded by Ninnox (2008) on Dixon Island and by Biota (2008a) at sites near Cape Lambert.</p> <p>The maximum count of 141 individuals accounts for 0.05% of the global population of this species. The majority of this species was recorded away from the proposed footprint in Cleaverville (67) and the South-west Mudflats (71). No significant impacts would be expected on this taxon as a result of the construction and operation of the Proposal.</p>
Common Greenshank** (<i>Tringa nebularia</i>)	Migratory/ Marine	<p>The common greenshank is a common migratory wader found both on the coast and inland, with preferred habitats including estuaries, mudflats, mangrove swamps and lagoons.</p> <p>Supporting Study 13.2 recorded this species as common across the Proposal area, being most common at high tide. A maximum count of 305 individuals was recorded during the southern migration (<0.03% global population count). It is unlikely that the Proposal area provides any key habitat areas for this species. No significant impacts would be expected to this taxon as a result of the construction and operation of the Proposal.</p>
Common Sandpiper*** (<i>Tringa hypoleucos</i>)	Migratory/ Marine	<p>The common sandpiper has a widespread distribution but is more commonly found in the northern regions of Australia. It occurs in a variety of habitats including coastal and interior wetlands, muddy edges of billabongs and lagoons, river pools, and mangroves (Morcombe, 2004). A single individual was recorded opportunistically on Anketell Point during Supporting Study 13.1. This species was also recorded by Ninnox (2008) on Dixon Island.</p> <p>This species was found to be widespread and frequent to the Proposal area (Supporting Study 13.2). Common sandpipers were recorded roosting at high tide in the South-east, East, Anketell Point, North and West regions, they were also recorded foraging at low tide on the South-east mudflats and Anketell Point West. Impacts on this species are likely to be low.</p>
Curlew Sandpiper** (<i>Calidris ferruginea</i>)	Migratory/ Marine	<p>Curlew sandpipers occur around the coasts in all states of Australia, and are also quite widespread inland, though in smaller number, and are recorded both during the non-breeding and also breeding seasons.</p> <p>The curlew sandpiper was considered to be uncommon to the Proposal area (Supporting Study 13.2), with 12 birds observed, and none being reported during Supporting Study 13.1. No significant impacts would be expected on this taxon as a result of the construction and operation of the Proposal.</p>

Species	EPBC listing status	Occurrence and significance of habitat
Eastern curlew*** (<i>Numenius madagascariensis</i>)	Migratory/ Marine	<p>Eastern curlew is a Priority Four listed species. As the largest wader in Australia, the eastern curlew has been recorded from most of Australia's coastline and is known to forage in tidal mudflats, sand spits of estuaries, mangroves, lake shores and ocean beaches (Morcombe, 2004).</p> <p>Low numbers of eastern curlews were observed during both Supporting Study 13.1 and 13.2. Eastern curlews were also recorded by Ninox (2008) on Dixon Island and Biota (2008a) near Cape Lambert.</p> <p>This species is far more abundant on the coastline between Port Hedland and Broome on passage and winters primarily in south-eastern Australia. Given the low numbers recorded in the study area, it is highly unlikely that the area is of critical importance to the species. No significant impacts are expected to occur to the species as a result of the Proposal.</p>
Great Knot** (<i>Calidris tenuirostris</i>)	Migratory/ Marine	<p>The great knot is a long-distance migrant that forages in large flocks. Preferred habitats include coastal areas such as, bays, harbours, estuaries, intertidal mud and sandflats and shorelines with mangroves (Higgins and Davies, 1996).</p> <p>During the southward migration survey, 524 (0.14% of the estimated global population count) individuals were recorded during high tide (Supporting Study 13.2). No significant impacts would be expected on this taxon as a result of the Proposal.</p>
Greater Sand Plover** (<i>Charadrius leschenaultii</i>)	Migratory/ Marine	<p>The greater sand plover is a gregarious species, often found in mixed flocks on intertidal zones and estuaries (Morcombe, 2004).</p> <p>Greater sand plovers were observed in the Proposal area during Supporting Study 13.1 and 13.2. The species was also recorded by Biota (2008a) on tidal flats at Cape Lambert.</p> <p>The Winter (Breeding Season) Shorebird Survey in Appendix A of Supporting Study 13.2 described this species as common, widespread and abundant during both low tide and at high tide roosts. Relatively high numbers were recorded during the breeding season, though well below the 1% IBA threshold (0.5% at the highest count). It is unlikely that the Proposal area is of critical importance to the species and impacts at a regional and global scale are not expected to be significant.</p>
Grey Plover** (<i>Pluvialis squatarola</i>)	Migratory/ Marine	<p>Grey plovers are usually solitary or occur in small flocks. They form large flocks at communal roosts, often with other waders (Marchant & Higgins 1993). The species is widespread when on passage, and it has been estimated that 3-4% of the world's population of grey plovers occur in Australia. These may represent 10-75% of the birds present in the East Asian-Australasian Flyway (Bamford et al. 2006; Stewart et al. 2007).</p> <p>Grey plovers usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons (Marchant & Higgins 1993).</p> <p>Supporting Study 13.2 found grey plovers to be frequent to the Proposal area, where birds were recorded roosting at high tide in the South-east and North-east regions of the study site. The species was observed during the northern and southern migration surveys and during the breeding season. Records were below 0.01% of the estimated global population. No significant impacts are expected to occur to this species as a result of the Proposal.</p>

Species	EPBC listing status	Occurrence and significance of habitat
Grey-tailed tattler*** (<i>Tringa brevipes</i>)	Migratory/ Marine	<p>Grey-tailed tattlers occur in coastal habitats, foraging in intertidal pools, mudflats and sand beaches. The species is a common summer migrant to northern Australia, with a typical pattern of high counts during non-breeding seasons (summer) and low counts during breeding season (winter)</p> <p>Very low numbers of Grey-tailed Tattlers (21) were observed during the June 2009 Survey (Supporting Study 13.1) with higher numbers observed (477) during high tide in the breeding season of July 2009. Southward migration surveys (October 2010) indicate that part of the survey area provides habitat for 1.32% of the estimated global population (see Spring (Southward Migration) Shorebird Survey in Appendix A of Supporting Study 13.2).</p> <p>Although other survey counts were below 1%, if the species follows the typical migratory pattern, it is possible populations may also occasionally exceed the 1% population threshold for significance during the northward migration (Supporting Study 13.2)</p> <p>The area between Dixon Island and the mainland consists of intertidal/soft sediment, including areas of sand and mudflats utilised by the Grey-tailed Tattler. API will implement measures to minimise impacts on Bouguer Passage by appropriate causeway design and the implementation of management measures, including inductions, access restrictions/procedures and signage.</p>
Lesser crested tern* (<i>Sterna bengalensis</i>)	Migratory/ Marine	<p>Lesser crested tern frequent shores of sandy beaches, mudflats of estuaries and creek channels across the north of Australia.</p> <p>Small groups (2 or 3 individuals) were observed on several occasions at both Dixon Island and on the mainland during Supporting Study 13.1. The species was also recorded by Ninnox (2008) on Dixon Island and by Biota (2008a) at sites near Cape Lambert. Thirteen lesser crested terns were observed during the southward migration survey commissioned by API (Supporting Study 13.2). Due to the low numbers recorded, it is highly unlikely that the Proposal area provides any key habitat areas or is of critical importance to this species. No significant impacts are expected to occur as a result of the Proposal.</p>
Lesser Sand Plover** (<i>Charadrius mongolus</i>)	Migratory/ Marine	<p>Within Australia, the lesser sand-plover has been recorded across all Australian states. The species feeds predominantly on freshly-exposed areas of intertidal sandflats and mudflats in estuaries, beaches and shallow ponds and occurs most frequently in northern and eastern Australia (Johnstone & Storr 1998).</p> <p>Internationally important sites in Western Australia (and their maximum counts) include: Eighty Mile Beach (1575); Roebuck Bay (1057); Broome (745); Port Hedland Saltworks (668) (Bamford et al 2008; Jaensch 1994).</p> <p>This species was not recorded during Supporting Study 13.1 and was uncommon in the Proposal area during Supporting Study 13.2 (56 individuals recorded).</p> <p>Given the low numbers recorded, it is highly unlikely the Proposed Port provides key habitat areas or is of critical importance to this species. No significant impacts are expected to occur as a result of the Proposal.</p>

Species	EPBC listing status	Occurrence and significance of habitat
Marsh sandpiper* (<i>Tringa stagnatilis</i>)	Migratory/ Marine	<p>The marsh sandpiper occurs along the WA coast and throughout parts of eastern Australia. It inhabits coastal and inland wetlands, estuarine and mangrove mudflats, beaches, swamps, lakes and several other types of wetlands.</p> <p>The species was recorded on two occasions (a flock of 30 and an individual) during Supporting Study 13.1. The species was not observed during Supporting Study 13.1 or by Ninox (2008) or Biota (2008a). It is highly unlikely that the Proposal area is of critical importance to this species. No significant impacts are expected to occur to the species as a result of the Proposal.</p>
Oriental Plover** (<i>Charadrius veredus</i>)	Migratory/ Marine	<p>The oriental plover may occur in small or large flocks in areas of open ground, including recently burnt areas. The oriental plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia.</p> <p>Internationally important sites in Australia and maximum counts for this species include: Eighty Mile Beach, Western Australia, (57,619), Port Hedland Saltworks, Western Australia, (29,900), Roebuck Bay, Western Australia, (8,750), Dampier Saltworks, Western Australia, (1,830), Lake Sylvester, Northern Territory, (1,022) (Jaensch 1994).</p> <p>Fourteen individuals (0.02% of estimated global numbers) were recorded during a southern migration survey. The species was not recorded during the northern migration or breeding season surveys, nor during Supporting Study 13.1. Given the low numbers observed across the Proposal area any potential for this species or key habitat areas of the species to be significantly affected by the Proposal is unlikely.</p>
Oriental Pratincole** (<i>Glareola maldivarum</i>)	Migratory	<p>The oriental pratincole is a common non-breeding visitor to the Kimberley and Pilbara coast between October and May (Johnstone and Storr 1998). This species can sometimes occur in very large flocks of thousands or tens of thousands of birds that congregate in open areas (Johnstone and Storr 1998).</p> <p>Internationally important sites in Australia and maximum counts include: Eighty Mile Beach, Western Australia, (2.88 million birds), and Roebuck Plains, Western Australia, (50 000) (Bamford et al 2008; Jaensch 1994).</p> <p>The oriental pratincole was the most numerous bird recorded on the tidal mudflats (71 individuals) south of Anketell Point during the Preliminary Bird Survey in October 2008. The species was not recorded during breeding season, northern or southern migration, nor during Supporting Study 13.1. Compared to the counts previously recorded at Australian Internationally important sites, it is highly unlikely that the Proposal area is of critical importance to the species.</p>
Pacific Golden Plover** (<i>Pluvialis fulva</i>)	Migratory/ Marine	<p>Within Australia, the pacific golden plover is widespread in coastal regions, and there are also a number of inland records in all Australian states.</p> <p>Supporting Study 13.2 found the pacific golden plover to be uncommon to the Proposal area, with 7 birds observed roosting at high tide in the North-east region and 1 bird found foraging at low tide on the South-west mudflats during the Southern migration.</p> <p>The area is not of critical importance to this species, and significant impacts to the species or key habitat areas are expected to as a result of this Proposal.</p>

Species	EPBC listing status	Occurrence and significance of habitat
Rainbow Bee-eater *** (<i>Merops ornatus</i>)	Migratory/ Marine	<p>The rainbow bee-eater is a fast flying brightly coloured bird which prefers open airspace for hunting. They are a common and regular summer migrant to southern Australia, and residents in northern Australia.</p> <p>Fourteen rainbow bee-eaters were recorded in both surveys during Supporting Study 13.1. The species was also recorded by Ninox (2008), Biota (2008), and during Supporting Study 13.</p> <p>This species is common and widespread, and due to the low numbers recorded in the Proposal area, development of Anketell Point is unlikely to affect the conservation status of this species.</p>
Red Knot** (<i>Calidris canutus</i>)	Migratory/ Marine	<p>Red knot was abundant during high tide in the northern migration survey. The species was not observed during the breeding season survey and maximum counts (69 individuals) remained below the 1% threshold (0.01%). Any potential for these species or key habitat areas of these species to be significantly affected by the Proposal is unlikely.</p>
Red-necked Stint*** (<i>Calidris ruficollis</i>)	Migratory/ Marine	<p>The red-necked stint is a small, highly sociable wader inhabiting a range of habitats including mudflats, salt marshes, beaches, saltfields and temporary floodwaters (Morcombe, 2004).</p> <p>A single specimen was observed during Supporting Study 13.1. The species was also recorded by Biota (2008a) on tidal flats at Cape Lambert.</p> <p>Supporting Study 13.2 recorded this species as common to the Proposal area during the northern and southern migrations as well as during the breeding season. A maximum of 486 birds were recorded foraging at low tide during the 2008 southward migration survey, and 319 were recorded during the 2010 southward migration survey. Between 0.13% and 0.15% of the estimated global population were recorded on southward and northward migrations. Lower numbers (0.05% of estimated global population) were recorded during the breeding season. It is unlikely that the Proposal area is of critical importance to the species on a global scale and no significant impacts are expected to occur to the species as a result of the Proposal.</p>
Ruddy Turnstone*** (<i>Arenaria interpres</i>)	Migratory/ Marine	<p>This species has an extremely large habitat range, often foraging in tidal areas with exposed rock, stones or shell beaches. They are known to be gregarious and sociable when feeding or roosting and usually occur in small flocks (Morcombe, 2004).</p> <p>Less than 0.02% of the estimated global population for this species was recorded from the Proposal area during the northern and southern migration and breeding season surveys (Supporting Study 13.2). One individual was recorded during Supporting Study 13.1.</p> <p>Due to the low numbers recorded for the ruddy turnstone, it is unlikely the Proposal area plays a key role in habitat or roosting sites and no significant impacts are expected to occur for this species as a result of the Proposal.</p>

Species	EPBC listing status	Occurrence and significance of habitat
Sanderling** (<i>Calidris alba</i>)	Migratory/ Marine	<p>This species is a full long-distance migrant that travels mainly via offshore and coastal routes, in small flocks. Sanderlings largely inhabit coastal areas with open sandy beaches exposed to the sea, rocky and muddy shores and mudflats.</p> <p>A maximum of twenty five individuals (<0.01% estimated global population) were recorded during Supporting Study 13.2. Due to the low numbers recorded, it is unlikely the Proposal area plays a key role in habitat and no significant impacts are expected to occur for this species as a result of the Proposal.</p>
Terek Sandpiper*** (<i>Tringa cinerea</i>)	Migratory/ Marine	<p>The terek sandpiper is a nervous species that inhabits coastal mudflats, sheltered estuaries and lagoons (Morcombe, 2004).</p> <p>This species was recorded as being frequent to the Proposal Area (Supporting Study 13.2). One individual was opportunistically noted on Dixon Island during the March 2010 survey (Supporting Study 13.1). No significant impacts are expected to occur as a result of the construction and operation of the Proposal.</p>
Whimbrel*** (<i>Numenius phaeopus</i>)	Migratory/ Marine	<p>The whimbrel is a gregarious species that often feeds in small flocks of mixed waders on coastal mudflats, beaches and reefs (Morcombe, 2004). This species is common across northern Australia.</p> <p>Less than 0.01% of the estimated global population of this species was recorded during the breeding season and northern and southern migration surveys. One individual was seen during Supporting Study 13.1. The species was also recorded by Ninox (2008) on Dixon Island.</p> <p>It is unlikely the Proposal area plays a key role in habitat or roosting sites, and no significant impacts are expected to occur for this species as a result of the Proposal.</p>
White-bellied sea-eagle* (<i>Haliaeetus leucogaster</i>)	Migratory/ Marine	<p>The white-bellied sea-eagle is a large bird of prey that often perches on cliffs or high tree limbs and forages and breeds in coastal environments including beaches, estuaries, mangroves and islands.</p> <p>The species was observed on several occasions on Dixon Island and near coastal sections of the mainland (Supporting Study 13.1). The species was also recorded by Ninox (2008) from Dixon Island and Biota (2008a) at Cape Lambert and Dixon Island during Supporting Study 13.2. Impact to this species are predicted to be low.</p>
Wood Sandpiper*** (<i>Tringa glareola</i>)	Migratory/ Marine	<p>This active wader inhabits open, swampy areas during breeding season and freshwater swamps, lakes, flooded pastures and occasionally mangroves outside of the breeding season. Wood Sandpipers occur as solitary individuals or in large flocks of mixed waders and are an uncommon migrant (Morcombe, 2004).</p> <p>One individual was observed on Dixon Island during Supporting Study 13.1. Impacts to the species are likely to be low.</p>

Notes:

* Recorded in Supporting Study 13.1

** Recorded in Supporting Study 13.2

*** Recorded in Supporting Studies 13.1 & 13.2

20.5.3 Terrestrial species

No fauna species listed on the EPBC Act database were found to occur within the Proposal area (Supporting Study 13.1).

Impacts to terrestrial fauna species in general have been addressed in Section 13 of the PER/draft PER. This section provides a summary of the primary impact on threatened species potentially occurring within the Proposal area, which would be due to the removal of habitat due to vegetation clearing, and associated fauna mortality and/or displacement of individuals. An analysis of habitat loss based on land system units for conservation significant fauna species potentially occurring in the Proposal area is provided in Table 20.6.

Table 20.6 Estimated habitat loss, based on land system units for conservation significant fauna species

Land System Unit	Description	Extent in Bioregion (ha)	Total Habitat Loss (ha)	Loss at Regional Scale (%)	Conservation Significant Species potentially occurring in Habitat
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	961,635	6.1	less than 0.001%	Northern quoll, Mulgara spp., Pilbara Olive Python.
Cheerawarra	Sandy coastal plains and saline clay plains supporting soft and hard spinifex grasslands and minor tussock grasslands.	49,211	238.9	0.5%	Northern quoll, Mulgara spp..
Littoral	Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches.	210,733	224.5	0.1%	Northern quoll.
Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands.	2,881,200	17.4	less than 0.001%	Northern quoll, Pilbara Leaf-nosed Bat, Pilbara Olive Python.
Ruth	Hills and ridges of volcanic and other rocks supporting hard spinifex (occasionally soft spinifex grasslands).	169,300	258.5	0.2%	Northern quoll, Pilbara Leaf-nosed Bat.
Uaroo	Broad sandy plains supporting shrubby hard and soft spinifex grasses.	987,066	3.7	less than 0.001%	Northern quoll, Mulgara spp..
Total for Land Systems			749.1		
Dixon Island (not yet mapped for land systems)			17.4		

On a regional scale, the largest impact on land system type as a result of the Proposal is on the Cheerawarra system. Potentially supporting the northern quoll and mulgara., approximately 0.5% of the total extent of this system within the bioregion will be removed by clearing associated with the Proposal.

Approximately 0.1% of the Littoral land system and 0.2% of the Ruth land systems within the region will be removed as a result of the Proposal. These land systems provide potential habitat areas for the northern quoll, and the northern quoll and Pilbara leaf-nosed bat respectively.

The Boolgeeda, Rocklea and Uaroo land systems potentially support the northern quoll, mulgara spp., Pilbara leaf-nosed bat and Pilbara olive python. The proportional loss of these systems at a regional scale is negligible, due to the small areas required to be cleared and the large extent of these systems in the Pilbara Bioregion (Table 20.6).

On a local scale, the Ruth, Littoral and Cheerawarra land systems will be most affected by the Proposal. The potential impacts on EPBC Act listed species potentially occurring within the Proposal area are discussed below.

Pilbara Leaf-nosed Bat (*Rhinonictus aurantius*) (Pilbara form)

Despite intensive Anabat recordings during Supporting Study 13.1 and those by Biota (2008a) and Ninox (2008), this species was not recorded. No suitable year round roosting habitats (e.g. deep caves/mine shafts) for this species were observed during the surveys conducted for Supporting Study 13.1. It is unlikely any significant impacts will occur to this species as a result of the Proposal.

Mulgara (*Dasyercus cristicauda*)

The nearest documented record of this species is approximately 200km east of the study area in sandy arid regions. It is unlikely that this species occurs within the Proposal area (Supporting Study 13.1) and impact to this species as a result of the Proposal is unlikely.

Northern Quoll (*Dasyurus hallucatus*)

There were no confirmed records of the northern quoll from within the Proposal area during any of the surveys commissioned by API. Although the northern quoll's footprints have been recorded from the west side of Dixon Island (Ninox, 2008), the species is most likely to occur on the rocky tors and hill slopes further inland of the disturbance footprint (Supporting Study 13.1).

The eastern end of Dixon Island, the subject of part of the Proposal, is exposed and flat, and unlikely to be frequented by the species. The Proposal will not create barriers to migration, and the northern quoll appears broadly distributed across the Pilbara Bioregion.

Implementation of the Proposal is not likely to significantly impact on the Pilbara population or range of this species and is unlikely to affect the conservation status of this species.

Pilbara Olive Python (*Liasis olivaceus barroni*)

No evidence was found to suggest that the Pilbara olive python occurs within the study area. Habitat within the study area is unsuitable or at best very marginal for this species (Supporting Study 13.1). The potential for this species or key habitat areas for this species to be affected by the Proposal is low.

Banded Hare-wallaby (*Lagostrophus fasciatus fasciatus*)

The banded hare-wallaby is extinct on the mainland, and is now restricted to Bernier and Dorre Island, Shark Bay. It is considered unlikely that this species occurs within the Proposal area and it was not recorded in surveys. The potential for this species or its range to be affected by the Proposal is low.

20.5.4 Terrestrial vegetation**Listed flora and Threatened and Priority Ecological Communities**

A search of the EPBC Act database did not identify any listed flora species or threatened ecological communities at the Proposal area.

20.5.5 Commonwealth Marine Areas

The EPBC Act defines a 'Commonwealth Marine Area' in which any action that is likely to have a significant impact on the environment is to be assessed. Assessment is based on the likelihood of the Proposal significantly impacting the Commonwealth Marine Area based on a number of criteria as listed in Section 20.3.3. The relevant elements of the proposal are parts of two of three dredge material disposal areas which fall within the Commonwealth Marine Area, and the turbid plume associated with dredging and dredge material disposal that may occur in the Commonwealth Marine Area.

Establishment of pest species

During a recent baseline survey within the Anketell Point region (September 2009), no listed introduced marine pests were observed. With appropriate management, including adherence to the National Biofouling Management Guidelines for Commercial Vessels and the Australian Ballast Water Management Requirements (see Table 9.11), the Proposal does not pose a significant risk of introduction of marine pests to the Commonwealth Marine Area. It is considered unlikely that impacts on marine fauna within the Commonwealth Marine Area will occur due to the introduction of marine pests.

Impact on marine ecosystem functioning or integrity

The predicted cumulative losses of BPPH associated with the Proposal are below the EPA defined cumulative loss guidelines for each proposed Local Assessment Unit as outlined within Section 7. Actual losses due to the Proposal will be confirmed post-construction, and are expected to be considerably less than the predicted losses due to the conservative nature of the indirect impact thresholds adopted (i.e. leading to an over-estimation of impact) and the implementation of management and mitigation measures (see Table 7.11). The integrity and ecological function of the marine ecosystem in the Commonwealth Marina Area is expected to be maintained.

Effect on a population of a marine species

With the implementation of management measures as proposed (see Table 9.7, Table 9.9, Table 9.11) it is considered unlikely that significant impacts to any species of marine mammal or turtle will occur. Monitoring programmes are proposed to evaluate any behaviour related impacts to marine mammals and any nesting related impacts to turtles. No significant impacts to other marine species including corals, filter feeders or epifauna (including crabs and prawns) are expected.

Substantial change in water quality

The proposed dredging programme will result in the generation of suspended sediment at the cutting, pickup and dredge material disposal areas, which has the potential to temporarily impact on the amenity of the area. There will be a variation in the strength and persistence of the sediment sources depending on the nature of the operations and ambient conditions (Supporting Study 7.1). The duration and the large spatial scale of the dredge operations are predicted to result in an area of elevated total suspended solids (TSS) extending, at times, kilometres from the dredge site. Temporary elevated TSS is expected to occur within Commonwealth waters during placement of spoil to two of three nominated dredge material disposal areas. No long term impacts to water quality are expected and management measures will be implemented to minimise impacts to BPPH (see Table 7.11). Discharge from a small proposed desalination plant will be rapidly diluted, such that the change in salinity will be within natural variation (0.5 PSU) within 25 m from the discharge point. An assessment of potential impacts associated with the desalination plant discharge is provided within Section 10.3.

Accumulation of potentially harmful chemicals in the marine environment

No source of potentially harmful chemicals has been identified within the Proposal area, and no such chemicals will be present within the Proposal area with the exception of hydrocarbons and minor quantities of water treatment chemicals. The storage and handling of hazardous materials will be strictly controlled to minimise the risk of leaks or spills into the marine environment (refer to Section 11, including Table 11.4).

Impact on heritage values

A search of the WA Museum Shipwreck database and DSEWPC's Australian national shipwreck database indicated that five shipwrecks are located in the area surrounding the Proposal (refer to Section 3). No reported wrecks are located within 15 km of the Proposal, and no impacts to any of the sites are expected. Should any shipwreck or article associated with a shipwreck be discovered during construction, API will ensure that these will be reported in accordance with the requirements of the Historic Shipwreck Act.

20.6 MITIGATION

Proposed management actions of specific relevance to mitigating impacts on matters of national environmental significance are described below.

The Project Environmental Management Plan will incorporate all relevant Environmental Management System procedures as discussed in Section 21.2, and will define environmental management measures applicable to the construction and operation phases and decommissioning of the Proposal. The Project Environmental Management Plan will comprise an overall environmental management framework and specific management sections to address relevant environmental factors.

Specific plans relevant to matters of national environmental significance that will form part of the Project Environmental Management Plan, and which are included as drafts in Appendix 3 of the PER/draft PER are: Dredge Environmental Management Plan; Marine Fauna Management Plan; Coastal Habitat Management Plan; Oil Spill Contingency Plan; Marine Pests Monitoring and Control Plan; Sediment Quality Management Plan; and Desalination Discharge Management Plan. A Cultural Heritage Management Plan will be prepared in consultation with the Ngarluma Aboriginal Corporation.

Table 20.7 Proposed Management actions relevant to species of national environmental significance

Action	Accountability	Timing
Marine Mammals		
Education of workforce of potential impacts to marine mammals during induction.	API Environmental Manager	All workforce inductions.
Marine fauna observers to maintain visual observations for marine mammals for 1.5 km line of sight.	API Environment Manager	Prior to and during piling driving, dredging and spoil disposal.
Marine fauna observers to maintain a 500 m low power zone and a 100 m suspension zone around pile driving.	API Environment Manager	Prior to and during pile driving.
Adherence of all construction vessels to EPBC regulations (2000) and implementation of a 'caution zone' of 300 m and a no approach zone of 100 m around whales, and a 150 m caution zone and 50 m no approach zone around dolphins.	Dredge Contractor Port Operator	Throughout duration of construction and operation.
Dredging or disposal operations will not commence if marine mammals are observed within the caution zone, and dredging operations will be suspended if marine mammals are observed within the no approach zone.	Dredge Contractor	Duration of dredging.
Implementation of speed limits for vessels ≥ 80 m in length and associated with the Proposal as follows (applicable to all waters during construction and to Port waters ²² during operations): <ul style="list-style-type: none"> • 14 knots during peak southern whale migration (mid-August to mid-October); and • 16 knots at all other times. 	Dredge Contractor Port Operator	Throughout duration of construction and operation.
Reporting to DEC and DSEWPC of any interactions with marine mammals.	Dredge Contractor	Within seven days of interaction as specified in EPBC Act.
Monitor spatial distribution of cetaceans in a before/during/after independent investigation and report to DEC and DSEWPC.	API Environmental Manager	Before, during and after construction and operations.
Marine Turtles		
Education of workforce of potential impacts to marine turtles during induction.	API Environmental Manager	All workforce inductions.
Access to Dixon Island by API and its contractors is to be restricted to authorised personnel only.	API Environmental Manager	At all times.
No vehicle access allowed on the beach. All incidents to be reported and tracked.	API Environmental Manager	At all times.
Marine fauna observers to maintain visual observations for marine turtles within 1.5 km line of sight.	API Environment Manager	Prior to and during piling driving.
Marine fauna observers to maintain a 500 m low power zone and a 100 m suspension zone around pile driving.	API Environment Manager	Prior to and during pile driving.
"Soft start" to pile-driving operations.	API Environment Manager	Daily during pile-driving.

²² To be defined by Port Operator (expected to be Dampier Port Authority)

Action	Accountability	Timing
Monitoring of pile-driving noise during initial operations to validate modelling predictions.	API Environment Manager	Pile driving.
Vibration monitoring at marine turtle nesting beaches on Dixon Island during blasting during turtle nesting season (September to March), and management of blasting as required.	API Environment Manager	During onshore blasting.
Appropriate lighting design, including shrouded or directional lighting, motion-sensor or timed lighting and use of appropriate wavelength light, as defined in the Marine Fauna Management Plan.	API Environment Manager	Duration of dredging, construction and operations.
Artificial light management for all marine vessels (e.g. covered portholes, low directional lighting) as defined in the Marine Fauna Management Plan.	Dredge Contractor	Duration of dredging.
Light measurements on Dixon Island turtle nesting beaches.	API Environment Manager	Construction and operations.
TSHD pumps to be cut when draghead off seabed.	Dredge Contractor	Duration of dredging.
Use of turtle exclusion devices (such as chain screens) on the TSHD dragheads.	Dredge Contractor	Duration of trailer suction dredging.
Investigate disturbance of seabed (e.g., by using drag chains or open beam trawl) prior to dredging by TSHDs.	Dredge Contractor	Duration of trailer suction dredging.
Reporting to DEC and DSEWPC of any interactions with marine turtles.	Dredge Contractor	Within seven days of interaction as specified in EPBC Act.
Investigations into feral animal predation of nests and implementation of bating programmes where appropriate.	API Environmental Manger	During the marine turtle nesting season.
Terrestrial Fauna		
Where there is flexibility with placement of Proposal infrastructure, avoid siting it in any habitat of high conservation significance.	Design Manager	Design stage.
Define clearing boundaries with ground markings (e.g., flagging) or as GPS coordinates in the earthmoving equipment prior to commencement of ground-disturbing activities.	Port Manager Project Manager	All stages.
Prevent unauthorised access to habitat of conservation significance.	Port Manager Project Manager	All stages.
Maintain natural drainage flows wherever practicable and prevent ponding of water.	Port Manager Project Manager	All stages.
Implement dust suppression measures during construction and operation.	Port Manager Project Manager	All stages.
Rehabilitate decommissioned construction areas to re-establish habitat.	Port Manager Project Manager	Throughout construction and on commissioning.
Include relevant fauna protection specifications in construction related contracts and subcontracts.	Port Manager Project Manager	All stages.

Action	Accountability	Timing
All members of the workforce are to be inducted regarding terrestrial fauna identification and encounter (including physical interaction with fauna, littering, feeding, approaching and unexpected fauna encounters).	Port Manager Project Manager	All stages – at induction.
Undertake a feral predator control programme. Control measures to be implemented will include (but not be limited to) the following actions: <ul style="list-style-type: none"> develop an animal sighting register that will record feral animal locations; putrescible waste will be managed in a manner so that it cannot act as a food source for animals; and regular feral animal control as warranted will be arranged through Environmental personnel. 	Port Manager Project Manager	All stages
Implement culverts to allow for movement of <i>Lerista neviniae</i> .	Port Manager Project Manager	Design stage.
Apply speed limits to mining equipment and light vehicles.	Port Manager Project Manager	All stages.
Ensure track-grinding maintenance is conducted in accordance with appropriate fire risk management and response plans.	Port Manager Project Manager	Operations.

20.7 PREDICTED OUTCOME

A number of species protected under the EPBC Act are known, or are considered likely, to occur within the Proposal area. These species may be affected by different aspects of the Proposal, most of which have been identified to constitute a low risk to fauna.

20.7.1 Marine species

With management measures as proposed, including application of a low power zone (500 m) and a suspension zone (100 m) around piling operations, adherence to EPBC regulations (2000) and implementation of a caution zone and no approach zone regarding the approach of vessels to marine mammals, and the presence of marine mammal observers on every dredge, implementation of the Proposal is unlikely to have significant impacts on marine mammals.

Part of Nickol Bay, focussed 15 to 20 km west of the Proposal site, may be a resting area for humpback whales based on data from aerial and vessel surveys commissioned by API. No impact on the utilisation of the potential resting area is predicted.

If management decisions are to be focussed on the identification and protection of humpback whale critical habitats it would appear that Nickol Bay does not represent a critical habitat (that is, one that is essential for the survival of this species) (C. Jenner, pers comm.). Mitigation procedures for the Proposal can be considered in light of the adequate baseline study (“before” of a before/during/after study). There is no evidence from the baseline study to suggest that this Proposal should not proceed given due consideration to planned mitigation processes (Supporting Study 9.1).

Given the management measures to minimise potential impacts on turtle nesting, including monitoring of vibration during rock blasting on Dixon Island during the flatback turtle nesting season and monitoring of light and nesting success at turtle nesting beaches on Dixon Island, no impacts on turtle nesting are expected.

Given the management measures proposed to minimise impacts to turtles, including implementation of a low power zone (500 m) and a suspension zone (100 m) around piling operations, monitoring of turtle interactions during dredging, and use of turtle exclusion devices (on trailing suction hopper dredge dragheads) and the investigation of deterrents (such as disturbance of the seabed prior to dredging), the impact on turtles are expected to be minimal.

The EPBC Act objective to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance will be met.

The EPA objective of maintaining the abundance, diversity, geographic distribution and productivity of marine mammals and turtles will also be met.

API's objectives to protect marine fauna listed under state and Commonwealth Law, and to manage and reduce the risks of introduced marine pests and prevent introductions and spread, will also be met.

20.7.2 Commonwealth Marine Areas

The primary aspect of the proposal that may result in impacts to the Commonwealth Marine area is dredging for creation of port facilities, which may result in a turbid plume extending into the Commonwealth Marine Area, and the disposal of dredge material in specifically designated areas which are partly located in the Commonwealth Marine Area.

As discussed in Section 20.5.5, due to proposed design and management, the Proposal is unlikely to have significant impact on the Commonwealth Marine Area, particularly in relation to the assessment criteria of likelihood of: establishment of pest species; impact on marine ecosystem functioning or integrity; effect on a population of marine species; substantial change in water quality; accumulation of potentially harmful chemicals in the marine environment; or impact on any heritage values.

The EPBC Act objective to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance will be met.

20.7.3 Terrestrial species

There will be no impact to flora species or threatened ecological communities listed on the EPBC Act database as a result of this Proposal.

The primary environmental aspect of the Proposal threatening EPBC Act listed fauna species is direct habitat loss through vegetation clearing. The removal of habitat will result in changes to the localised abundance and distribution of terrestrial fauna.

Fauna habitats may be of conservation significance because they are uncommon, support unique assemblages and/or support fauna of conservation significance (Biota 2006). Fauna habitats of highest conservation significance in the study area (locally significant) are the mangrove communities and the sand dune habitat on Dixon Island.

Excluding avifauna, no evidence was found to suggest the presence of any EPBC Act listed terrestrial fauna within the Proposal area. Regional terrestrial fauna habitat status and associated biodiversity values are unlikely to be affected as a result of this Proposal.

20.7.4 Avifauna

The primary environmental aspect threatening EPBC listed avifauna is direct loss of habitat.

Implementation of the Proposal will remove or disturb habitat utilised by migratory bird species. Based on data collected during Supporting Studies 13.1 & 13.2, the Proposal area does not contain significant global populations of any bird species protected under the EPBC Act.

The Proposal is not considered to pose a significant risk to any key habitat areas, roost sites or food sources for any EPBC Act listed avifauna. Habitats to be disturbed as a result of the Proposal are well represented outside the proposal area.

Current data suggests population numbers exceed the 1% threshold level for one migratory wader, the Grey-tailed Tattler (1.32% of the estimated global population). The predominant foraging location for this species is the south-west mudflats. Any disturbance to the intertidal/soft sediment areas within the Bouguer Passage will be minimised by appropriate causeway design that minimises changes to the existing tidal (and sediment) transport regimes. Management measures, including inductions, access restrictions/procedures and signage will be employed to control access to the mudflats by the workforce (contractors and employees).

20.7.5 Overall Outcome

The Proposal is likely to result in the disturbance and loss of habitat of some species protected under the EPBC Act. The Proposal area is not considered to contain any significant areas of key habitat for any of the listed species, and habitats likely to be affected are well represented outside of the Proposal area. The project environmental management and monitoring plans that will be implemented, specifically the Coastal Habitat Management and Marine Fauna Management Plans, will also serve to mitigate these local scale impacts. The possible use of Nickol Bay west of the Proposal area, by humpback whales as a resting area, is unlikely to be interrupted by the Proposal given the separation distances. Aerial and vessel-based surveys are ongoing to assist in evaluation of the significance of Nickol Bay for humpback whales. The potential impact to EPBC Act listed species as a result of the Proposal is unlikely to be significant.

The EPBC Act objective to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance can be met by implementing the mitigation and management measures as outlined in the Marine Environmental Management Plan, Coastal Habitat Management Plan and this Section.