

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT



Varanus acanthurus

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Australia

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

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EXECUTIVE SUMMARY

ENV Australia Pty Ltd (ENV) was commissioned in October 2007 to undertake a terrestrial biological assessment survey for the BHP Billiton Iron Ore's proposed Outer Harbour Development (the project). The project area covers approximately 20,303 ha and is located west and south-west of Port Hedland in the Pilbara region of Western Australia.

A two-phase (summer and winter) fauna survey was undertaken of the Outer Harbour Development project area from 12 October - 9 November 2007 and 5-16 May 2008 respectively. This assessment was completed in accordance with *EPA Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56*. The objectives of the assessment included documenting habitat types within the project area, compiling a list of fauna species likely to occur in the project area, including conservation significant species, conducting a terrestrial fauna trapping survey and making seasonal comparisons of data.

In the summer survey eight trapping sites were established and used for an average of 64 trap-nights for pit, cage and Elliott traps, and 128 trap-nights for funnel and pot traps. A further two trap sites were established for the winter survey, and used for an average 80 trap-nights for pit, cage and Elliott traps, and 160 trap-nights for funnel and pot traps. This fauna trapping program recorded 54% of the expected fauna species for the project area, and is therefore believed to be adequate.

The project area comprises six fauna habitat types: Dunal, Riverine, Mangrove, Tidal Flats, Samphire and Sandplain. Habitats of conservation significance included those which supported unique faunal assemblages (i.e. the Dunal habitat), those which provided fauna movement corridors (i.e. Riverine habitat), those which are regularly used by fauna of conservation significance such as migratory shorebirds (i.e. Tidal Flat and Mangrove habitats) or those that are comparatively small in the Pilbara region (i.e. Tidal Flat and Mangroves). In addition to the fauna work by ENV, the Mangrove habitat type has been specifically investigated in a separate study (SKM 2009). The Sandplain habitat, the most dominant habitat within the project area, is not considered to be of conservation significance and is well represented outside of the project area. The Samphire habitat is not considered to be of conservation significance as it lacks an array of microhabitats for fauna to exploit and does not support migratory birds to the extent of Tidal Flats and Mangroves.

There are isolated features in the project area, such as quartz outcrops, a billabong (Cooliarin Pool), rock piles and a limestone hill, which, although not complete fauna habitat types, are nonetheless considered important microhabitats. Of these features, Cooliarin Pool is considered to be of conservation significance as it provides potential habitat for avian fauna of conservation significance, namely *Neochmia ruficauda clarescens* (the Star Finch).

A pronounced seasonal difference in the recorded numbers of birds was evident, with 98 species of birds recorded in summer and 74 bird species recorded in winter. The seasonal difference in the number of birds recorded reflects the arrival of summer visitation of migratory shorebirds and waders. The number of recorded species of mammals, reptiles and amphibians did not show any significant seasonal variation, possibly due to the lack of summer rainfall that was experienced at the time of the survey.

Of the 199 recorded fauna species, 23 are protected under legislation, i.e. are listed under the *Environment Protection and Biodiversity Conservation Act 1999*, and/or the *Wildlife Conservation Act 1950*. One species recorded in the survey, the python *Aspidites ramsayi* (Woma), is listed as Schedule 4 under the *Wildlife Conservation Act 1950*, as Priority 1 by the Department of Environment and Conservation, and as Endangered on the International Union for Conservation of Nature (IUCN) Red List. This species was recorded opportunistically (sighted) outside of the proposed disturbance envelope in the Sandplain habitat during the winter survey only. The Sandplain habitat is well represented within and outside the project area, and even though direct habitat loss may result in localised mortalities, the broader representation of the Woma in the region is not likely to be compromised by the project.

Recorded species listed as Priority Fauna species by the Department of Environment and Conservation included *Mormopterus loriae cobourgensis* (Little North-western Free-tail Bat), *Ardeotis australis* (Australian Bustard), and *Numenius madagascariensis* (Eastern Curlew). These species were recorded in Mangrove, Sandplain and Tidal Flat habitats, respectively. As these habitats are present within the proposed disturbance envelope, clearing associated with the project may result in loss of potential roosting hollows or nesting sites, although none were specifically observed during the surveys. The Little North-western Freetail Bat, Australian Bustard and Eastern Curlew are highly mobile species and therefore are unlikely to be impacted by clearing activities.

Twenty-two of the recorded bird species are listed as Migratory species under the *Environment Protection and Biodiversity Conservation Act 1999*. The majority of these birds use the Mangrove and Tidal Flat habitats for foraging and roosting during summer. Localised mortalities of Migratory listed birds are considered unlikely to result from construction as no nesting sites were observed within the proposed disturbance envelope during the field surveys. The impact upon the foraging grounds of the migratory species due to the small area of the disturbance envelope in these habitats.

The project is unlikely to significantly affect the representation of the fauna habitats in the project area, and therefore the fauna they support.

1 INTRODUCTION

ENV.Australia Pty Ltd (ENV) was commissioned in October 2007 to undertake a terrestrial fauna assessment for BHP Billiton Iron Ore's proposed Outer Harbour Development in Port Hedland, Western Australia (the project). This report documents the findings of two seasons of fauna surveying, conducted in summer and winter, within the proposed Outer Harbour Development project area. The fauna assessment was conducted in accordance with *Guidance Statement No. 56 Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* of the WA Environmental Protection Authority (EPA) (EPA 2004). The objectives of the fauna assessment were to:

- document the general habitat types of the project area as they relate to faunal assemblages;
- compile (from database searches) a list of terrestrial vertebrate fauna likely to occur in the project area;
- identify (from database searches) terrestrial vertebrate fauna of conservation significance that may occur in the project area;
- report on the likely occurrence of terrestrial vertebrate fauna, including that of conservation significance, in the project area, based on habitats present and their condition;
- document any opportunistic records of fauna observed onsite;
- conduct a terrestrial vertebrate fauna trapping survey within the project area;
- document seasonal comparisons of data; and
- undertake an impact assessment with reference to the project disturbance envelope.

1.1 LOCATION

The project area lies west and south-west of the towns of Port Hedland and South Hedland, and covers an area of 20,303 ha from Finucane Island to the decommissioned Boodarie Hot Briquette Iron (HBI) Plant and inland to the Newman to Port Hedland rail line in the south-east (Figure 1).

1.2 PROPOSED INFRASTRUCTURE

The proposed Outer Harbour Development terrestrial infrastructure is shown on Figure 2 and includes:

- three rail options, 2007 Rail Options A and B, and 2008 Rail Option C (the preferred rail option otherwise known as 'the proposed Western Spur Railway') which originate from the area of the decommissioned Boodarie HBI Plant and connect with the existing Newman to Port Hedland rail line;
- stockyards to the north of the decommissioned Boodarie HBI Plant;
- four car dumpers and associated conveyor tunnels within the area of the decommissioned Boodarie HBI Plant;
- a transfer pad on Finucane Island; and
- an infrastructure corridor (including conveyors, access roadway and utilities) from the stockyards to the transfer pad.

To allow for the location of potential construction laydown areas, a liberal disturbance envelope surrounds the above proposed infrastructure (Figure 2), although it is unlikely that all of this area will be disturbed by the project.

1.3 PHYSICAL ENVIRONMENT

1.3.1 Climate

The Pilbara region has an arid-tropical climate with two distinct seasons, a hot summer from October to April and a mild winter from May to September. The Port Hedland area experiences a wide range of temperatures throughout the year, with an average temperature of 33.2 °C. In summer, maximum temperatures may reach 48.2 °C, whilst in winter, minimum temperatures may reach 3.2 °C (Bureau of Meteorology 2009).

Rainfall in the Pilbara is often sporadic, and can occur year-round. Port Hedland has average annual rainfall of 303 mm (Figure 3). Summer rainfall is a result either of tropical storms or of tropical cyclones that cross the coast and move inland. Winter rainfall is generally lighter, and is the result of cold fronts moving across the State.

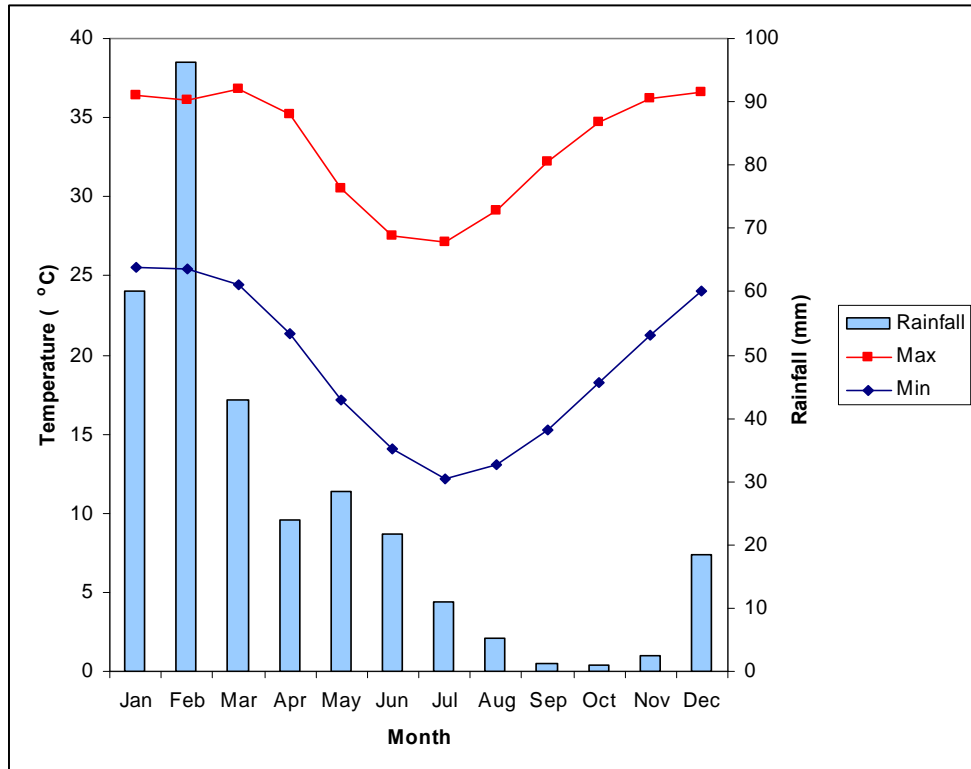


Figure 3: Average monthly rainfall and maximum and minimum temperatures for the Port Hedland area (Bureau of Meteorology 2009).

The summer season survey was completed in October and November 2007, while the winter season survey was completed in May 2008. The Port Hedland area had received relatively low amounts of rainfall preceding both surveys, with only 9 mm falling in the three months before the summer survey and 103 mm in the three months before the winter survey (Figure 4). The area received very little rainfall during the summer months, as few cyclones crossed the WA coast in the 2007-2008 cyclone season (Bureau of Meteorology 2009). On average, the area usually receives 224 mm from January to April, but it received only 110 mm for the same period in 2008.

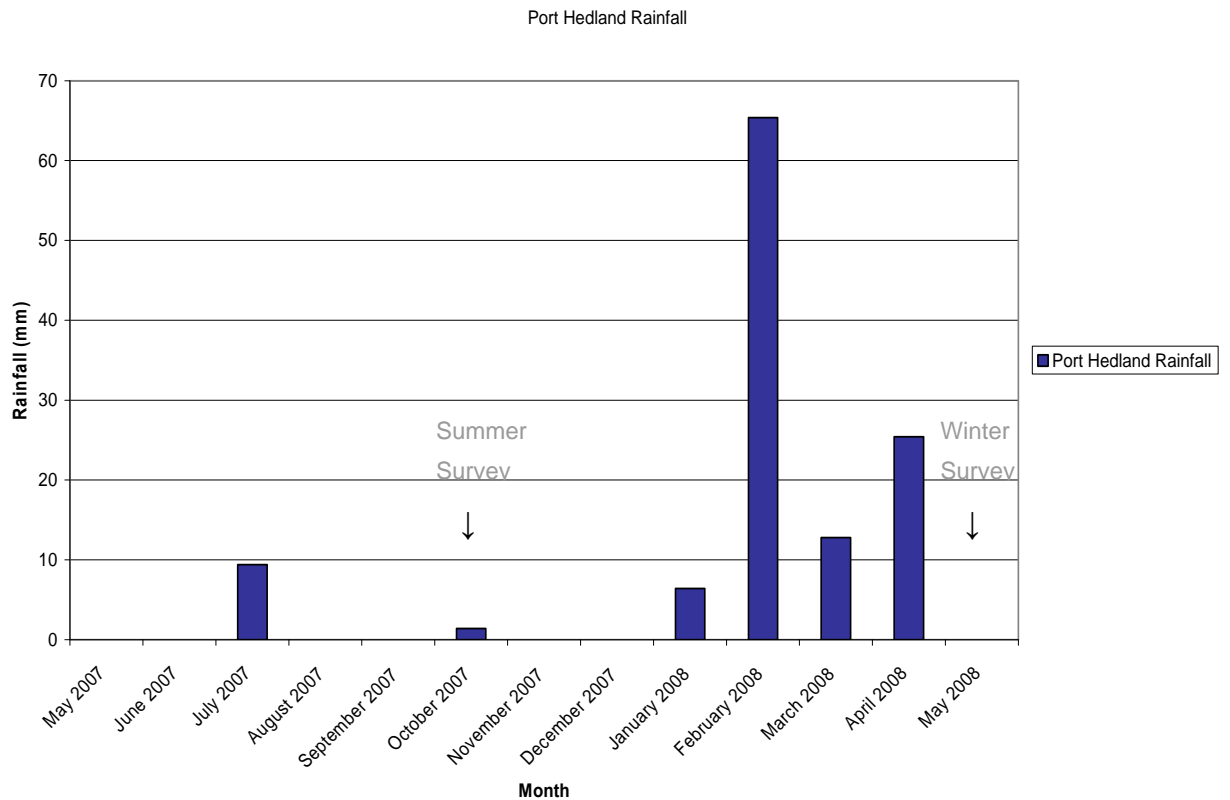


Figure 4: Rainfall received by the Port Hedland area from May 2007 to May 2008 (Bureau of Meteorology 2008).

1.3.2 Geology and Soils

The geology of the project area was mapped as consisting of the following nine units as per Geological Survey of Western Australia (1983) (Figure 5):

Qhm:	Mud and silt
Qhs:	Silty sand, red brown, containing <i>Anadara granosa</i>
Qny:	Younger beach and dune shelly sand
Qr:	Residual sand
Qp:	Dune Limestone
Ql:	Lime cemented beach conglomerate
Qc:	Clayey sand, abundant claypans
Qps:	Silty sand, red brown
Qs:	High-level sands.

The geology of the far southern extent of the project area is also mapped as consisting of the following four units as per Geological Survey of Western Australia (2001) (Figure 5):

- Qao: Alluvial sand, silt and clay on floodplains.
- Qaoc: Mixed floodplain deposits with numerous small claypans.
- Qaa: Alluvial sand and gravel in rivers and creeks; clay, silt, and sand in channels on floodplains.
- AgLpe: Pegmatite; metamorphosed.

1.4 BIOLOGICAL ENVIRONMENT

1.4.1 Biogeography

The Interim Biogeographic Regionalisation for Australia (IBRA) divides Australia into 85 bioregions based on major biological and geographical/geological attributes (Thackway & Cresswell 1995). These bioregions are subdivided into 404 subregions, as part of a refinement of the IBRA framework (Department of Environment and Water, Heritage & Arts 2009).

The project area is located within the Pilbara bioregion and Roebourne subregion (Thackway & Cresswell 1995). Coastal areas in the subregion typically contain alluvial and colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia stellaticeps* or *Acacia pyrifolia* and *Acacia inaequilatera*. The subregion also contains areas of Samphire, *Sporobolus* and mangal on marine alluvial flats and river deltas.

The project area is located within the Abydos Plain, which forms part of the Fortescue Botanical District in the Eremaean Botanical Province of Western Australia, as per Beard (1975).

1.4.2 Land Systems

Land system mapping is based on regional patterns in topography, soils and vegetation. The most recent land system mapping of the Pilbara bioregion was completed by van Vreeswyk *et al.* (2004). The mapping divides the Pilbara region into 102 land systems. The project area includes four main land systems (Figure 6), which are:

- Lit: Littoral: Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches; forms 0.9 % (1577 km²) of the Pilbara bioregion;

- Mac: Macroy: Stony plains and occasional tor fields based on granite supporting hard and soft Spinifex grasslands; forms 7.2% (13095 km²) of the Pilbara bioregion;
- Riv: River: Active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft Spinifex grasslands; forms 2.3 % (4088 km²) of the Pilbara bioregion; and
- Uar: Uaroo: Broad sandy plains; supporting shrubby hard and soft Spinifex grasslands; forms 4.2 % (7681 km²) of the Pilbara bioregion.

1.4.3 Vegetation Mapping

Beard (1975) broadly mapped the project area as Spinifex with no shrubs or trees and Mangroves on Finucane Island, dwarf shrub steppe and grass savanna mixed with Spinifex near the decommissioned HBI Plant and through the middle of the project area, and granite plains near the Newman to Port Hedland rail line in the south-east of the project area. Beard (1975) vegetation mapping has been incorporated into mapping undertaken by the Department of Agriculture (Shepherd *et al.* 2002), and is illustrated in Figure 7. The corresponding Shepherd *et al.* (2002) codes as shown on Figure 7 are presented in brackets below. The six vegetation associations mapped for the area are:

- t₁Hi: Hummock grasslands, grass steppe; soft Spinifex (AP117);
- Mud: Bare areas; mud flats (AP127);
- Mangroves: Thicket; mangroves (AP43);
- a₁₈Zr.t₁Hi: Hummock grasslands, dwarf-shrub steppe; Acacia over Spinifex (AP647);
- xGc/t₁Hi: Mosaic: short bunch grassland – savanna/grass plain (AP589); and
- a₂Sr.t₁Hi: Hummock grasslands, shrub steppe; kanji over soft Spinifex (APC93).

Beard vegetation mapping has been incorporated into mapping undertaken by the Department of Agriculture (Shepherd *et al.* 2002), and is illustrated in Figure 7.

1.5 PREVIOUS BIOLOGICAL SURVEYS

The flora and fauna of the Pilbara have not been systematically recorded to date, with the significant exceptions of flora studies by Burbidge (1959) and Beard

(1975). More recently, the Western Australian Department of Agriculture (van Vreeswyk *et al.* 2004) conducted an inventory and condition survey of the Pilbara region. This report provides a regional inventory of flora species and a description of land resources. The Department of Environment and Conservation (DEC) is currently preparing the results of a comprehensive and systematic field review of the Pilbara region (DEC Pilbara Biological Survey 2002-2009), and is due for public release shortly.

In recent decades, a boom in large-scale regional resource development projects has resulted in a significant amount of site-specific biological survey work being carried out in the Pilbara, mostly for formal environmental approvals. Within 10 km of the project area various biological surveys have been conducted over the last 10 years. Those most relevant to the current survey are as follows:

- Hedland HBI Project – Boodarie Site – Flora, Vegetation and Vertebrate Fauna Survey (Mattiske Consulting 1994), a Level Two Survey;
- Biodiversity Assessment of the Utah Point Berth Project (Biota 2007), a Level One Survey.
- Flora and Fauna Assessment of RGP5 Spoil Area A, Port Hedland Harbour (Biota 2008) a Level One Survey; and
- Flora and Fauna Review of DMMA H (Biota 2009), a Level One Survey.

Those surveys conducted further afield from the project area (i.e. greater than 50 km) include:

- Hope Downs Iron Ore Project (Hope Downs Management Services Pty Ltd 2000, 2002), a Level One Survey; and
- Fortescue Metals Group (Biota 2004) a Level Two Survey.

A more comprehensive bibliography of biological survey work undertaken in the Pilbara is available at <http://science.dec.wa.gov.au/projects/pilbaradb/>.

2 METHODOLOGY

2.1 BACKGROUND TO SURVEY METHODOLOGY

2.1.1 State and Federal Legislation

All surveys undertaken by ENV are designed to meet the requirements of the following State and Federal legislation:

- *Environmental Protection Act 1986* (WA) ('EP Act 1986');
- *Wildlife Conservation Act 1950* (WA) ('WC Act 1950'); and
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('EPBC Act 1999').
- *Agriculture and Related Resources Protection Act 1976* (DAFWA' 2007)

The surveys were carried out in a manner designed to be compliant with the Environmental Protection Authority ('EPA') requirements for the environmental surveying and reporting of fauna surveys in Western Australia, as set out in the following documents:

- *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3* (EPA 2002); and
- *EPA Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56* (EPA 2004).

EPA Guidance Statement No. 56 (EPA 2004) outlines the expectations of the EPA regarding the extent, design and intensity of field surveys for environmental assessments. The following two formal levels of fauna survey are defined by the *EPA Guidance Statement No. 56*:

- **Level One:** a desktop study to collate historical knowledge conducted in conjunction with a reconnaissance survey (site inspection); and
- **Level Two:** a trapping and opportunistic field survey to characterise the fauna present, combined with a Level One survey.

Throughout most areas of the State where the scale and nature of the proposed impact is moderate to high, a Level Two survey will be required. This is typically the case for most resource development projects. As the project has the potential to significantly impact fauna habitats, a Level Two survey was undertaken for the project area.

2.1.2 Fauna of Conservation Significance

Fauna species are protected formally and informally by various legislative and non-legislative measures, which are as follows:

Legislative Protection

EPBC Act 1999:

- Threatened Fauna Species;
- Threatened Ecological Communities;
- Japan-Australia Migratory Bird Agreement (JAMBA);
- China-Australia Migratory Bird Agreement (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA);
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
- Migratory Species List.

WC Act 1950:

- Scheduled Fauna Species.

EP Act 1986:

- Offers protection to Threatened Ecological Communities and other environmentally sensitive areas.

As this is a terrestrial fauna survey, species listed under the EPBC Act as Marine have not been included.

Non-Legislative Protection

DEC Priority lists:

- Priority Fauna Species; and
- Priority Ecological Communities.

Informal recognition of fauna considered to be of local significance by community action groups.

- International Union for Conservation of Nature (IUCN) Red List;

- endemic species;
- range extensions; and
- species under taxonomic review.

A short description of these Acts, and the definitions of the species conservation codes and ecological community categories they use, and those used by the DEC and the IUCN, is provided in Appendix A.

2.1.3 Introduced Species

Fauna may also be 'Declared' by the Department of Agriculture and Food under the *Agriculture and Related Resources Protection Act 1976 (WA)*. Declared Fauna are gazetted under seven categories (A1-A7), which define the action required. A declaration may apply to the whole State or districts. Management of Declared fauna varies on the categories it falls within (Department of Agriculture and Food ('DAFWA') 2007).

2.2 SURVEY METHODOLOGY

2.2.1 Desktop Review

The purpose of the desktop review was to gather background information on the project area, and the fauna it may support. Results of searches of the Western Australian Museum's and DEC's FaunaBase (WAM 2008), DEC's threatened fauna database, the EPBC's Species Profiles and Threats Database (SPRAT), records of shorebirds and waders from Birds Australia (2008), the EPBC's Protected Matters Search Tool, and a literature review of fauna surveys conducted in the vicinity of the project area were used to compile a list of fauna species potentially occurring in the project area. These searches were conducted between the coordinates 20° 17' 6"S, 118° 27' 13"E to 20° 33' 26"S, 118° 39' 40"E. Due to the duration of this project, a DEC database search was submitted in both 2007 and 2009.

Information on the habitats likely to occur in the project area was gained through studying aerial photos, maps and previous surveys conducted in the project area. This information was then used to refine the potentially occurring species list. This list was further refined once the field habitat assessment was completed.

2.2.2 Field Survey

The purpose of the field survey was to verify the accuracy of the desktop study and to further delineate and characterise the fauna and faunal assemblages in the project area. The fauna field survey was undertaken in summer 2007 and winter 2008, and consisted of:

- a fauna habitat assessment;
- a trapping program;
- opportunistic searches;
- an ornithological census; and
- bat recordings.

Habitat Assessment

During the field survey, broad fauna habitats were identified based on vegetation associations and landforms. Fauna habitats were then mapped using aerial photography and GPS locations recorded during site reconnaissance. Habitat mapping focussed on areas adjacent to proposed infrastructure.

Fauna habitats were assessed for their potential to support species of conservation significance and the quality of habitat they provided to fauna. Fauna habitats were given an informal rating of value to faunal assemblages: High, Medium or Low. This was based on:

- vegetation complexity;
- the presence of microhabitats, including significant trees with hollows, loose bark, fallen hollow logs and leaf litter;
- fauna species biodiversity;
- habitat quality or condition; and
- providing elements to support fauna of conservation significance.

Representation within the region was assessed using van Vreeswyk et al. (2004) and Beard (1975) mapping, focusing mainly on geographic distribution and extent.

For the purposes of assessing the conservation significance of fauna habitats, ENV considers that fauna habitats given a rating of High value should also be considered of conservation significance.

Trapping Program

Trapping sites were established in each fauna habitat type identified through the habitat assessment, except for the Mangrove habitat (as this area was deemed unsuitable for trapping and an assessment of Mangroves was undertaken separately (SKM 2009)). Trapping sites were located in areas considered representative of the habitat types. Each trapping site contained up to ten

trapping units. Each unit consisted of 7-metre long fences, with one bucket trap at the centre of the fence, two pot traps halfway between the bucket trap and the end of the fence, and a funnel trap at each end. The trapping units were approximately 30 m apart, with one Elliott trap and one cage trap at each trapping unit. Details of the trapping units at each site are presented in Appendix B.

Summer Survey

Eight sites were established in the project area, consisting of six sites within the Sandplain, one site within the Riverine habitat and one site within the Dunal habitat. The summer field survey was conducted between 12 October and 9 November 2007, with traps open for eight nights (note that not all trapping sites were surveyed simultaneously). Each trapping site was subjected to an average of 64 trap-nights for bucket, cage and Elliott traps and 128 trap-nights for funnel traps and pot traps.

Winter Survey

In the winter survey (5-16 May 2008) the eight summer sites were reopened, and two new sites within the Sandplain habitat were established in the rail Option C footprint. The location and habitat details of each site are detailed in Appendix B, and are illustrated in Figure 8, with site photographs presented in Appendix C. Traps were open for eight nights during the winter trapping programme. Each trapping site was subjected to an average of 80 trap-nights for bucket, cage and Elliott traps, and 160 trap-nights for funnel traps and pot traps. The extra trap-nights for the winter field survey were due to the additional trap sites installed. Details of trap effort are presented in Appendix B.

Opportunistic Searches

Opportunistic diurnal and nocturnal searches of major habitats in the project area were undertaken to search for evidence (direct or indirect) of fauna species. Searches included:

- investigating burrows;
- investigating rock crevices;
- investigating scats, tracks and other traces;
- splitting exfoliated rock;
- turning rocks and fallen timber;
- opening standing timber crevices; and

- raking leaf litter.

Ornithological Census

Ornithological surveys were undertaken throughout the project area. Census locations were not specifically limited to trap site locations, but rather all habitats were surveyed across the entire project area. The Ornithologist spent additional time in habitats assessed as likely to support threatened species and unique or poorly represented habitat in an effort to record species not recorded in earlier surveys. Details of the ornithological census are presented in Appendix D.

Bat Recordings

Acoustic echolocation bat recordings were undertaken at dusk and early evening, using AnaBat II recording units to document the presence of bat species in the area. The detectors convert ultrasonic echolocation signals produced by bats into audible electronic signals, which are later analysed to determine the presence of species-specific calls. Trees and bridges identified as potential bat roosting or maternal nesting sites were targeted for AnaBat II recordings. In addition, AnaBat II units were set in areas likely to be utilised by bats for foraging (e.g. gullies and drainage lines). AnaBat II recording locations and details are presented in Appendix E and in Figure 9.

The site-specific data relevant to capture records are presented in Appendix F.

2.2.3 Taxonomic Identification

Where field identification of the fauna species was not possible, specimens were collected for later identification by expert taxonomists from the WAM Collections and Research Facility.

2.3 PERMITS

Specimens collected during the survey were taken by permit of and subject to the conditions of the following licence issued under Regulation 17 of the WC Act 1950:

- SF006090 11/10/2007 – 10/10/2008.

3 FAUNA SURVEY LIMITATIONS AND CONSTRAINTS

It is important to note the specific constraints and/or limitations imposed on individual surveys, as identified by the EPA under *Guidance Statement No. 56* (EPA 2004). Constraints and/or limitations are often difficult to predict, as is the extent to which they influence survey outcomes. The survey constraints and limitations experienced during the Outer Harbour Development fauna surveys are detailed in Table 1.

Table 1: Constraints Associated with the Fauna Assessment

Variable	Impact on Survey Outcomes
Experience levels/ Resources	<p>The biologists who executed these surveys were practitioners suitably qualified in their respective fields.</p> <ul style="list-style-type: none"> • Mr Mick Welsh – Senior Zoologist • Mr Mike Brown – Zoologist • Mr Stephen Reynolds – Ornithologist • Ms Katherine Chuk– Field Assistant • Mr Justin Freeman – Field Assistant • Ms Anyssa Tucker – Field Assistant • Mr Shane McAdam – Field Assistant
Scope: sampling methods/ Intensity	<p>The surveys undertaken were conducted in accordance with ‘Level Two’ surveys as defined by EPA <i>Guidance Statement No. 56</i>. These surveys included habitat assessment, a trapping program, and opportunistic observations.</p>
Proportion of fauna recorded/ Completeness	<p>The summer phase survey recorded 180 taxa, which is 49 % of the expected fauna for the project area</p> <p>The winter phase survey recorded 142 taxa, which is 39 % of the expected fauna for the project area.</p> <p>A combined result for both surveys recorded 199 taxa, which is 54 % of the expected fauna for the project area. The previous survey recorded a total of 99 species (Mattiske Consulting 1994).</p>
Sources of Information	<p>At the bioregion level, the Pilbara has been the subject of many targeted biological surveys, primarily for the resources sector. Previous studies completed in the vicinity of the project area include a Level Two vertebrate fauna survey at Boodarie (Mattiske Consulting 1994), a Level One Fauna Assessment of RGP5 Spoil Area A, Port Hedland (Biota 2008), and Level One Fauna Assessment at the Utah Berth, Port Hedland (Biota 2007).</p>

Variable	Impact on Survey Outcomes
	Fauna surveys conducted further a field include Hope Downs rail line and Fortescue Metals Group rail line (Hope Downs 2000, 2002; Biota 2004).
Proportion of task completed	The field surveys were completed adequately, with the trapping program and opportunistic searches carried out to a sufficient level. Trapping and opportunistic searches were conducted for 28 nights for the summer phase survey and 12 nights for the winter phase survey.
Timing, weather, season.	<p>The summer survey was undertaken in October/November 2007. The area had received 9 mm of rainfall in the three months preceding the survey (Bureau of Meteorology 2009). Day temperatures were in the mid-30s Celsius, with night temperatures falling just below 20 °C (Bureau of Meteorology 2009). These temperature conditions were not likely to limit the activity of any faunal group.</p> <p>The winter survey was undertaken in May 2008. The area had received 110mm of rain in the year to date (January-April). The area received very little rainfall during the summer months, as few cyclones crossed the WA coast in the 2007-2008 cyclone season (Bureau of Meteorology 2009).</p> <p>Day temperatures were in the mid-30s Celsius, with night temperatures falling just below 20 °C (Bureau of Meteorology 2009). These temperature conditions were not likely to limit the activity of any faunal group.</p>
Disturbances	No disturbances affected the outcomes of either fauna surveys.
Access problems	The Mangrove and Tidal Flat habitats were initially considered unsuitable for trapping sites because of the difficulties posed by tidal variations. Increased opportunistic effort was used to compensate for this, and a separate impact assessment has since been carried out for the mangroves in the project area (SKM 2009). Access to the western side of the conveyor to Finucane Island was restricted during both surveys, and it was not possible to undertake trapping in this area. Aerial photography and visual confirmation during the survey was used to determine the habitats within this area.

4 RESULTS

4.1 HABITAT ASSESSMENT

The project area consists of Mangroves, Dunal systems, Tidal Flats and Samphire in the northern coastal areas, and Sandplains with scattered Riverine habitats throughout most of the remaining area. Most of the habitats in the project area, and in the greater Port Hedland area, have been disturbed to some degree by development and other anthropogenic processes. Six broad habitat types were observed in the project area (Table 2 and Figure 10).

Table 2: Information on Major Habitat Types for the Project Area

Habitat Type	Habitat Value	Conservation Significance	Survey	Site Number
Dunal	High	Yes	Summer, Winter	9
Riverine	High	Yes	Summer, Winter	10, 6
Mangrove	High	Yes	Summer, Winter	(no trap site)
Tidal Flats	High	Yes	Summer, Winter	(no trap site)
Samphire	Low	No	Summer, Winter	(no trap site)
Sandplain	Medium	No	Summer, Winter	2, 3, 4, 5, 7
	Medium	No	Winter	13, 15

Note: Habitat Value is based on ENV's assessment as described in Section 2.2.2

4.1.1 Dunal Habitat

The Dunal Habitat of Finucane Island occurs in the Littoral land system (van Vreeswyk *et al.* 2004) (Figure 6). The vegetation of the north-facing dunes is primarily low *Acacia stellaticeps* shrublands over *Cenchrus ciliaris* grasslands, and the south-facing dunes consist of open *Crotalaria cunninghamii* shrublands over *Cenchrus ciliaris* grasslands. This habitat is considered of high habitat value and therefore of conservation significance as it may support a unique faunal assemblage which may include reptiles such as *Eremiascincus fasciolatus* (Narrow-banded Sand Swimmer) and shorebirds and seabirds, many of which are migratory or marine listed birds under the EPBC Act. The Dunal habitat type is restricted to the northern section of the project area on Finucane Island.

4.1.2 Riverine Habitat

The Riverine habitat, with its thick vegetation dominated by *Eucalyptus* species, is also considered of high habitat value as it provides an abundance of

microhabitats such as trees, leaf litter, and soils suitable for burrowing species. This habitat type is associated with the River land system (van Vreeswyk *et al.* 2004). The fauna species or assemblages within this habitat are not unique to the project area; they are, however, diverse. The embankments of this habitat may be suitable for nesting bird species such as *Merops ornatus* (Rainbow Bee-eater). This habitat has value as an ecological linkage, as its drainage lines can serve as important corridors for fauna movement. For these reasons, Riverine habitat is considered to be of conservation significance.

4.1.3 Mangrove Habitat

The Mangrove habitat is associated with the Littoral land system of van Vreeswyk *et al.* (2004). This habitat occurs in the tidal areas around the southern side of Finucane Island and on the mainland surrounding West Creek, and is dominated by *Avicennia marina*. The Mangrove habitat is considered to be of high habitat value, and therefore of conservation significance, as this type of habitat is known to support *Mormopterus loriae cobourgensis* (Little North-western Bat), which is listed by the DEC as Priority 1. The Mangrove habitat also supports a unique faunal assemblage or fauna species that are habitat specialists. This is reflected in the principles of *Guidance for the Protection of Tropical Arid Zone Mangroves along the Pilbara Coast* (EPA 2001), where the EPA consider the mangroves of the Port Hedland area to be of high conservation value and stipulates the need for minimal disturbance. A separate assessment has been undertaken on the mangroves in the project area (SKM 2009).

4.1.4 Tidal Flat Habitat

The Tidal Flat habitat is found within the Littoral land system of van Vreeswyk *et al.* (2004). This habitat is located within intertidal areas, and is characterised by large open bare areas and scattered *Avicennia marina* shrubs and scattered low samphire species. Despite a lack of vegetative cover, the Tidal Flat habitat is considered of high habitat value, and therefore of conservation significance, as it is known to support non-breeding migratory shorebirds and waders, many of which are of conservation importance. During low tides, shorebirds or waders can spread broadly amongst this habitat, but during high tide these species may congregate at the western end of Finucane Island.

4.1.5 Samphire Habitat

The Samphire habitat is closely associated with the Mangroves and Tidal Flats on Finucane Island. This habitat also occurs in the Littoral land system of van Vreeswyk *et al.* (2004) (Figure 6). This habitat type is characterised by large open muddy areas with limited vegetation complexity, which limits the shelter available for fauna. Unlike the Tidal Flat and Mangrove habitat, the Samphire habitat is considered of low habitat value, and therefore not of conservation significance. It does not provide breeding habitat for conservation significant birds

that potentially use the habitat and is not used by migratory shorebirds or waders to the extent that Tidal Flats are.

4.1.6 Sandplain Habitat

The majority of the project area consists of the Sandplain habitat type, which is found in the Uaroo land system (van Vreeswyk *et al.* 2004) (Figure 6). The Sandplain habitat, with its thick vegetation dominated by *Acacia* species, is considered of medium habitat value, as it provides an abundance of microhabitats such as shrubs, leaf litter, and soils suitable for burrowing species. The Sandplain is habitat for locally significant ground-dwelling reptiles, such as *Diporiphora valens* and *Delma elegans*, and mammals such as *Dasykaluta rosamondae* (Little Red Kaluta), and *Notomys alexis* (Spinifex-hopping Mouse). This habitat also supports conservation significant species such as the python *Aspidites ramsayi* (Woma), and the bird *Ardeotis australis* (Australian Bustard), both of which were recorded in the survey. Therefore, while it is important in supporting a diverse array of fauna species and in particular, species with conservation significance, because of the widespread occurrence of this habitat within the Port Hedland area, and more specifically, the Pilbara region (4.2% of the Pilbara region (van Vreeswyk *et al.* 2004)), the Sandplain habitat in the project area is not considered to be of conservation significance.

4.1.7 Other Habitat Features

There are certain isolated features in the project area which are not complete fauna habitats, but which are nevertheless worthy of comment as fauna microhabitats. These small isolated features, such as quartz outcrops, billabongs (i.e. Cooliarin Pool), rockpiles, and limestone hills, can provide shelter and foraging areas for species in a fragmented landscape. Amphibian species will be attracted to permanent water bodies like Cooliarin Pool, and some rock-dwelling herpetofauna will be located in rockpiles and quartz outcrops. With the exception of Cooliarin Pool, these features, although uncommon do not support unique faunal assemblages or populations of conservation significant terrestrial vertebrate fauna species. Cooliarin Pool, with its permanent water, is likely to support a diverse array of fauna, including avian fauna of conservation significance such as the Star Finch (*Neochmia ruficauda clarescens*).

4.2 RECORDED FAUNA

4.2.1 Mammals

Forty-five species of mammal potentially occur in the project area (Appendix G1). In the summer survey, 22 species were recorded in the project area, while 19 were recorded in the winter survey (Appendix H). Twenty-six species of mammal were recorded in the two phases of the survey (Appendix H), representing 57 % of the potentially occurring mammals for the project area. No extra mammal species were recorded in the additional winter survey areas.

Seven mammal species were recorded in the summer survey that were not recorded in the winter survey, while the winter survey recorded three species not recorded in the summer survey (Appendix G1).

Three of the 25 species recorded, *Mormopterus loriae cobourgensis* (Little North-western Freetail Bat), *Dasykaluta rosamondae* (Little Red Kaluta) and *Zyzomys argurus* (Common Rock-rat), are considered to have some level of conservation importance, and are discussed below.

DEC Priority List

One species on the DEC Priority list was recorded in the survey: *Mormopterus loriae cobourgensis* (Little North-western Freetail Bat).

Mormopterus loriae cobourgensis (Little North-western Freetail Bat) is a DEC Priority 1 species and inhabits mangrove communities, roosting in crevices and spouts of the dead upper branches of the mangrove *Avicennia marina* (Strahan 1995). This species was recorded in the Mangrove habitat on Finucane Island, inside the disturbance envelope, and probably moves amongst the coastal mangroves in the surrounding region (pers. comm., R. Bullen). This species was recorded in both seasons of the fauna survey within the same area of mangroves, suggesting a permanent roosting spot is present in the area. With some inspection however no roosting hollows were identified during the survey. Little is known of the distribution and ecology of the Little North-western Freetail Bat. This species has previously been recorded between Gales Bay to the south of Port Hedland and Pardoo to the north (pers. comm., R. Bullen). The DEC Threatened and Priority Database return five records of the Little North-western Freetail Bat, with the most recent being recorded in 2005.

IUCN Red List

Of the 26 species of mammal recorded in both surveys, all species were rated as Least Concern on the IUCN Red List (Appendix G1), except for *Mormopterus loriae cobourgensis* (Little North-western Freetail Bat), due to the subspecies not being recognised.

Locally Significant

Two species determined as being locally significant were recorded in the survey:

- *Dasykaluta rosamondae* (Little Red Kaluta); and
- *Zyromys argurus* (Common Rock-rat).

Dasykaluta rosamondae (Little Red Kaluta) is confined to subtropical arid hummock grassland in the Pilbara (Menkhorst & Knight 2004), where it inhabits areas of dense *Spinifex* (Strahan 1995). This species is mainly nocturnal, feeding on invertebrates and small reptiles (Menkhorst & Knight 2004). The Little Red Kaluta was recorded in both phases of the current survey, at numerous sites in a variety of habitats (Appendix F).

Zyromys argurus (Common Rock-rat), although found in other regions of Western Australia such as the Kimberley, has a disjunct population in the Pilbara. *Zyromys argurus* inhabit rocky outcrops, breakaways and scree slopes (Strahan 1995). It is one of the most commonly-recorded species in the Pilbara, with individuals recorded in a number of surveys conducted in the area surrounding Port Hedland (Appendix G1). One individual was trapped at Site 9, within the dunal habitat, on Finucane Island (see Figure 8; Appendix F).

Introduced Fauna

Of the 26 mammal species recorded in the survey, seven are introduced species:

- **Mus musculus* (House Mouse);
- **Oryctolagus cuniculus* (European Rabbit);
- **Canis lupus familiaris* (Wild Dog);
- **Vulpes vulpes* (European Fox);
- **Felis catus* (Feral Cat);
- **Equus caballus* (Horse); and
- **Bos taurus* (Cattle).

The above introduced mammal species are widespread across much of Australia, occurring in an extensive range of habitats (Strahan 1995). These species are known to spread rapidly, occupying a variety of surroundings, preying on and competing with native species and destroying agricultural areas. Of these mammals, the cat, rabbit, wild dog, fox and horse are listed as Declared by the Department of Agriculture and Food (DAFWA 2007).

4.2.2 Reptiles

One hundred and nine species of reptile potentially occur in the project area (Appendix G2). In the summer survey, 47 species were recorded in the project area, and 44 were recorded in the winter survey (Appendix I). A total of 53 species of reptile were recorded across the two phases of the survey (Appendix I), representing 48 % of the potentially occurring reptiles for the project area.

Nine species were recorded in the summer survey that were not recorded in the winter survey, while six species were recorded in the winter survey that were not recorded in the summer survey (Appendix G2).

Twelve of the 53 reptile species recorded are considered to have some level of conservation importance, the most significant of these being the python *Aspidites ramsayi* (Woma). The other 11 species are considered locally significant, and are discussed below.

WC Act 1950

One species Scheduled under the WC Act 1950 was recorded in the survey: *Aspidites ramsayi* (Woma).

Aspidites ramsayi is listed as Schedule 4 under the WC Act 1950, as Priority 1 by the DEC and as Endangered on the IUCN Red List. This species inhabits spinifex within woodlands, heaths and shrublands (Wilson & Swan 2003). It is restricted to arid areas, where it shelters in hollow logs, animal burrows or thick vegetation (Cogger 2000). Such habitats are generally well represented in the project area and in the Pilbara region. This species was opportunistically recorded from the Sandplain habitat during the survey of the additional winter areas. *Aspidites ramsayi* was observed outside of the proposed disturbance envelope to the east of the Great Northern Highway, near the junction of the 2007 and 2008 rail options (50K 664207mE 7734443mN; shown on Figure 10). The DEC Threatened and Priority Database return two records of the Woma, with the most recent being recorded in 2001.

DEC Priority List

Only one recorded species is listed as Priority 1 on the DEC Priority list: the python *Aspidites ramsayi* (Woma). As this species is also listed as Schedule 4 under the WC Act 1950, it is discussed above (see WC Act 1950 section).

IUCN Red List

Only one recorded species is listed as Endangered on the IUCN Red list: *Aspidites ramsayi* (Woma). As it is also listed as Schedule 4 under the WC Act 1950, it is discussed above (see WC Act 1950 section).

Locally Significant

Eleven species of reptile recorded in the survey are considered of local conservation importance (Appendix G2):

- *Nephrurus levis pilbarensis* (Smooth Knob-tailed Gecko);
- *Ctenotus duricola*;
- *Ctenotus grandis titan*;
- *Ctenotus rufescens*;
- *Lerista bipes*;
- *Lerista muelleri*;
- *Morethia ruficauda exquisita*;
- *Varanus bushi* (Pilbara Goanna);
- *Ramphotyphlops ammodytes*;
- *Acanthophis wellsi* (Pilbara Death Adder); and
- *Demansia rufescens* (Rufous Whip-snake).

These species are not protected by legislation, but are considered of local importance because of their restricted distribution and/or specific habitat requirements, because they are under taxonomic review or because they have disjunct populations in the Pilbara.

Most of these species inhabit areas of dense shrubs, soft soil for burrowing and/or areas of plentiful leaf litter offering shelter. For example, *Lerista bipes*, *Ctenotus grandis titan* and *Ctenotus rufescens* often inhabit spinifex grasslands with soft sandy soils conducive to digging and burrowing (Wilson & Swan 2003). *Ctenotus duricola*, on the other hand, inhabits hard clay stony soils (Wilson & Swan 2003).

The *Nephrurus levis pilbarensis* (Smooth Knob-tailed Gecko), a skink *Morethia ruficauda exquisita*, *Varanus bushi* (Pilbara Goanna), the blind snake *Ramphotyphlops ammodytes*, *Acanthophis wellsi* (Pilbara Death Adder) and *Demansia rufescens* (Rufous Whip-snake) occur only in the Pilbara, making them endemic to the region. *Lerista muelleri* is under taxonomic review (Western Australian Museum), and is also assessed as being of local conservation importance. The habitats of these species are well represented in the project area and more broadly across the Pilbara.

4.2.3 Amphibians

Ten species of amphibians potentially occur in the project area (Appendix G3). In the summer survey, four species were recorded in the project area (Appendix J). The winter survey recorded five species in the project area. Six of the 10 potentially occurring species were recorded from the two phases of the survey, with three of these species recorded in both phases (Appendix J).

The summer survey recorded two species not recorded in the winter survey:

- *Litoria rothii* (Roth's Tree-frog); and
- *Uperoleia russelli* (Russell's Toadlet).

Two species were recorded in the winter survey that were not recorded in the summer survey:

- *Cyclorana australis* (Giant Frog); and
- *Limnodynastes spenceri* (Spencer's Frog).

The six amphibians recorded in the project area compare well with no amphibian species recorded by the surveys of Mattiske Consulting (1994) and Biota (2008) (Appendix G3).

IUCN Red List

The seven amphibian species recorded for the survey are all listed as Least Concern on the IUCN Red List. Such taxa are considered widespread and abundant, and not exclusively dependent on the project area at the local level. None of the recorded amphibian species are protected by legislation.

4.2.4 Birds

Two hundred and two species of bird potentially occur in the project area (Appendix G4). In the summer survey, 98 species were recorded within the project area and 74 were recorded in the winter survey (Appendix K). One hundred and six species of avifauna were recorded in the two phases of the survey (Appendix K) representing 56% of the potentially occurring birds for the project area.

Twenty-eight species were recorded during the summer survey and not in the winter survey. Eight species were recorded in the winter survey and not in the summer survey (Appendix G4).

All bird species recorded are either protected under the EPBC Act 1999, are listed as Priority species by the DEC, and they are discussed below. No bird species recorded were listed under the WC Act 1950 or are considered locally

significant. Forty-eight of the 106 recorded birds comprised marine affiliated birds (shorebirds and seabirds, and mangrove passerines)(Appendix G4).

EPBC Act 1999

Twenty-two bird species recorded during the survey are listed as Migratory species under the EPBC Act 1999. Most of these species were recorded in mangrove and tidal flat habitat types. These habitat types support most of the migratory waders found in the project area, and many of these non-breeding migrants will use these habitats for foraging and roosting during the summer.

DEC Priority List

Two DEC Priority List bird species were recorded during the surveys:

- *Ardeotis australis* (Australian Bustard); and
- *Numenius madagascariensis* (Eastern Curlew).

Ardeotis australis is listed as Priority 4 by the DEC and as Near Threatened by the IUCN Red List. This species is typically widespread, but is locally scarce. It inhabits woodlands and grasslands, moving widely over large areas (Johnstone & Storr 1998). *Ardeotis australis* was recorded from the Sandplain habitat during both seasons of the current survey. The DEC Threatened and Priority Database has two records of the Australia Bustard, with the most recent being recorded in 2005 at Port Hedland.

Numenius madagascariensis is listed on the DEC Priority Fauna List as Priority 4. This species is also listed as a Migratory under the EPBC Act 1999 and as Least Concern on the IUCN Red List. *Numenius madagascariensis* mainly inhabits tidal flats and mangrove areas, and is also known to occur at sandy beaches. This species was recorded only in the summer season in the tidal mudflats and mangroves.

IUCN Red List

Two species listed as Near Threatened on the IUCN Red List were recorded in the survey:

- *Anhinga melanogaster* (Darter); and
- *Ardeotis australis* (Australian Bustard).

Anhinga melanogaster is rated as Near Threatened by the IUCN Red List. This species inhabits lakes, swamps and various other water bodies, nesting on twigs and sticks in forks of *Melaleuca* and *Eucalyptus* trees (Johnstone & Storr 1998).

This species was recorded only in the summer season survey, and was previously recorded in the area by Mattiske Consulting (1994).

Ardeotis australis was recorded, and is discussed above (see DEC Priority List section).

The remaining 89 recorded bird species are listed as Least Concern on the IUCN Red List (Appendix G4). Such taxa are considered widespread and abundant, and not exclusively dependent on the project area at the local level. These species are not protected by legislation.

4.3 POTENTIALLY OCCURRING FAUNA

Species of conservation importance that potentially occur in the project area, but were not recorded during the field survey, are discussed in the following sections.

4.3.1 Mammals

Nineteen species (additional to those recorded) of mammal potentially occur in the project area, of which 15 are either protected under the EPBC Act 1999, the WC Act 1950, are listed as Priority species by the DEC, are on the IUCN Red List or are considered of local conservation importance. These species are discussed below.

EPBC Act 1999

Three mammals listed as Threatened by the EPBC Act 1999 potentially occur in the project area:

- *Dasyercus blythi* (Brush-tailed Mulgara);
- *Dasyurus hallucatus* (Northern Quoll); and
- *Rhinonicteris aurantia* (Pilbara Leaf-nosed Bat).

Dasyercus blythi has recently had its name changed from *Dasyercus cristicauda* which is listed as Vulnerable (EPBC Act 1999 and IUCN Red List) and as Schedule 1 (WC Act 1950). The name *Dasyercus blythi* is currently only listed as Priority 4 by the DEC, with the name change yet to be updated with the EPBC Act 1999 (*pers comm.* Saravan Peacock DEWHA). This species is found in central Western Australia in sandy regions, living in burrows, and has been recorded at Goldsworthy (BHP Iron Ore 2000) (Appendix G1). The DEC Threatened and Priority Database search returned one record of *Dasyercus blythi*, with the recording being in 2008 at Boodarie. This species is likely to occur in the Sandplain habitat type in the project area.

Dasyurus hallucatus is listed as Endangered by the EPBC Act 1999 and as Schedule 1 by the WC Act 1950. It is known to occur in a range of vegetation types, but favours rocky areas and is known to den in rock crevices. Despite the historical records on the DEC's NatureMap, very little suitable habitat occurs in the project area and therefore *Dasyurus hallucatus* is unlikely to be present in the project area.

Rhinoicteris aurantius (Pilbara Leaf-Nosed Bat form), is rated as Vulnerable under the EPBC Act 1999 and as Schedule 1 by the WC Act 1950. Pilbara Leaf-nosed Bats generally require deep caves or disused mine shafts in which to roost (Strahan 1995). They have been found sporadically in iron ore project areas across the Pilbara, including Yarrie, Hashimoto and R Deposit, where they are generally sparsely distributed. This species was not recorded during the current survey or the surveys previously undertaken in the vicinity of the project area (Mattiske Consulting 1994 and Biota 2008). However, records of the bat have been made on the Roebourne Plain and Abydos Plain, and are known from several sites in the uplands adjoining the plains (pers. comm Bob Bullen). This species is unlikely to be found roosting in the project area but can not be ruled out as using the area for foraging.

WC Act 1950

Three mammals listed as Scheduled under the WC Act 1950 potentially occur in the project area:

- *Dasyercus blythi* (Brush-tailed Mulgara);
- *Dasyurus hallucatus* (Northern Quoll); and
- *Rhinoicteris aurantia* (Pilbara Leaf-nosed Bat).

These species are also listed as Threatened under the EPBC Act 1999, and are therefore discussed above (see EPBC Act 1999 section).

DEC Priority List

Five (additional to those recorded) mammals listed as Priority under the DEC Priority list potentially occur in the project area:

- *Dasyercus blythi* (Brush-tailed Mulgara);
- *Lagorchestes conspicillatus* (Spectacled Hare-wallaby);
- *Macroderma gigas* (Ghost Bat);
- *Leggadina lakedownensis* (Lakeland Downs Mouse); and

- *Pseudomys chapmani* (Western Pebble-mound Mouse).

Lagorchestes conspicillatus is listed as DEC Priority 3. There have been no recent (within the past 50 years) records of this species by WAM (WAM 2009), the DEC Threatened and Priority Fauna Database or by other environmental studies in the Pilbara. *Lagorchestes conspicillatus* is a widespread inhabitant of open forests, open woodlands, tall shrublands, over tussock grass and hummock grassland (Strahan 1995). Because of the few capture records and the limited amount of preferred habitat in the project area, this species is unlikely to occur.

Macroderma gigas is listed as Priority 4 by the DEC, as Vulnerable by the IUCN Red List, and was recorded on the Threatened database maintained by the DEC at Boodarie in 2001. Ghost Bats occur in a wide variety of habitats, and require an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia, and is sensitive to disturbance (Strahan 1995). The Ghost Bat is known to occur from the De Grey River through to Onslow, and although it is mainly found in the uplands along the coast, it is also known to use the coastal plains (pers. comm. R. Bullen). As no roosting sites were recorded within the project area, the Ghost Bat may only forage temporarily within the project area, and is unlikely to be dependent on habitats found within the project area.

Leggadina lakedownensis is listed as DEC Priority 4. This species was not recorded at Boodarie by Mattiske Consulting (1994), but has been recorded further afield at the Hope Downs rail line and FMG rail line (Hope Downs Management Services Pty Ltd 2002; Biota 2004). *Leggadina lakedownensis* is known to prefer Sandplains and clay pans (DEC 2007) with a good cover of Spinifex and shrubs. Such habitat is well represented outside the project area, and therefore, if present, *Leggadina lakedownensis* is not likely to be dependent specifically on the habitats in the project area.

Pseudomys chapmani is listed as Priority 4 by the DEC. This species is also recognised as a Pilbara endemic. No individuals were observed from the project area, but an abandoned pebble mound was located on a rocky outcrop at GDA 94 MGA Zone 50 671217mE 7725777mN (Figure 10), which is outside of the proposed disturbance envelope. This species has been historically recorded in the surrounding area, and its habitat is well represented elsewhere in the Pilbara. As there is only historical evidence, no records on the DEC's Threatened Database, and limited preferred habitat, this species is unlikely to occur within the project area.

IUCN Red List

Three species listed as Vulnerable by the IUCN Red List potentially occur in the project area:

- *Dasyercus blythi* (Brush-tailed Mulgara);
- *Macroderma gigas* (Ghost Bat); and
- *Rhinonicteris aurantia* (Pilbara Leaf-nosed Bat).

These species are discussed above (see EPBC Act 1999 and DEC Priority sections).

The remaining potentially occurring native mammal species are listed as Least Concern by the IUCN Red List. These species are widespread and abundant, and not necessarily dependent on habitat types in the project area.

Locally Significant

Three (additional to those recorded) mammal species potentially occurring in the project area are considered of local conservation importance, as they are endemic to the Pilbara region:

- *Ningui timealeyi* (Pilbara Ningui);
- *Rhinonicteris aurantia* (Pilbara Leaf-nosed Bat); and
- *Pseudomys chapmani* (Western Pebble-mound Mouse).

Ningui timealeyi inhabits Mallee scrublands or dense hummock grasslands along drainage lines (Menkhorst & Knight 2004). This species was not recorded during surveys in the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). The preferred habitat of the Pilbara Ningui is well represented inside and outside the project area boundaries. If present, this species is likely to occur within Riverine and associated Sandplain habitats.

Rhinonicteris aurantia and *Pseudomys chapmani* are discussed above (see EPBC Act 1999 and DEC Priority sections respectively).

4.3.2 Reptiles

Fifty-six species (additional to those recorded) of reptile potentially occur in the project area, of which 14 are listed as Priority species by the DEC or are considered of local conservation importance: these species are discussed below. No reptile species (additional to those recorded) potentially occurring are listed under the EPBC Act 1999, the WC Act 1950, or the IUCN Red List.

DEC Priority List

One reptile species (additional to those recorded) potentially occurring in the project area is listed on the DEC Priority Fauna List (Appendix G2) - the blind snake, *Ramphotyphlops ganei*.

The blind snake *Ramphotyphlops ganei* is listed as Priority 1 by the DEC. There are few previous records of this species, and no records for this species from studies carried out in the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). Blind snakes are typically very hard to detect in biological surveys, yet common taxa such as *Ramphotyphlops grypus* (recorded in this survey) are usually recorded at least once per survey. There are few records of this species, and little is known of its habitat requirements, although capture records suggest it prefers rocky or stony soils (Wilson & Swan 2003). This species may occur within the sandplain habitat with rocky outcropping or areas with a stony or rocky soil profile.

Locally Significant

Fourteen reptile species (additional to those recorded) potentially occurring in the project area are considered of local conservation importance as they are known to have specific habitat requirements, or are endemic to the Pilbara.

Some of these species have specific habitat requirements and inhabit areas of dense shrubs, soft soil for burrowing and/or areas of plentiful leaf litter offering shelter. For example, *Ctenotus rubicundus* and *Ctenotus rutilans* often inhabit soft sandy soils, and *Diporiphora valens* inhabits Spinifex grasslands. Other species, such as *Diplodactylus savagei* and *Lucasium wombeyi*, reside in gorge and rocky scree type habitats. *Heteronotia spelea* (Pilbara Cave Gecko) and *Egernia pilbarensis* are also restricted to gorges and breakaways, inhabiting rocky outcrops.

Some of these species are endemic to the Pilbara region, including *Varanus pilbarensis* (Pilbara Rock Monitor), *Ramphotyphlops pilbarensis* (Pilbara Blind Snake), *Suta punctata* (Spotted Snake) and *Vermicella snelli* (Pilbara Bandy Bandy Snake).

None of the aforementioned species were recorded in previous surveys in the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). Due to habitat restrictions there is a low likelihood of them occurring in the project area.

4.3.3 Amphibians

Three species (additional to those recorded) of amphibian potentially occur in the project area, all of which are rated as Least Concern on the IUCN Red List, and one species is considered of local significance (Appendix G3). No amphibian

species potentially occurring are listed under the EPBC Act 1999 or the WC Act 1950 or are listed as Priority species by the DEC.

IUCN Red List

The amphibian species potentially occurring in the project area are listed as Least Concern on the IUCN Red List. Such taxa are generally considered widespread and abundant, and not exclusively dependent on the project area at the local level.

Locally Significant

One amphibian species potentially occurring in the project area, *Uperoleia glandulosa* (Glandular Toadlet), is considered of local conservation importance. It has a restricted distribution, and is confined to the coastal area surrounding Port Hedland (WAM 2008). The Glandular Toadlet inhabits claypans and flooded depressions amongst surrounding grasses and sedges (Cogger 2000). Suitable habitat for this species is present within the Sandplains of the project area; however, it is also well represented in the surrounding region.

4.3.4 Birds

Eighty-nine species (additional to those recorded) of bird potentially occur in the project area, all of which are protected either under the EPBC Act 1999, the WC Act 1950, are listed as Priority species by the DEC, are rated on the IUCN Red List and/or are considered of local conservation importance. The potentially occurring species are discussed below.

Five bird species (additional to those recorded) derived from the Birds Australia Top 30 shorebirds list (Birds Australia 2008) potentially occur in the project area. These species have previously been recorded at Port Hedland and at Finucane Island. These species may be found wading within the mangroves and tidal flats of the project area.

EPBC Act 1999

Of the bird species potentially occurring in the project area, 10 species (additional to those recorded) are listed as Migratory under the EPBC Act 1999 (Appendix G4). These species are likely to reside within the mangroves and tidal flats of the project area, as these species are mostly migratory shorebirds or waders.

One species, *Pezoporus occidentalis* (Night Parrot), is listed as Endangered under the EPBC Act 1999. The Night Parrot is also listed as Schedule 1 by the WC Act 1950 and as Critically Endangered on the IUCN Red List. This species is known to inhabit inland plains and Spinifex breakaways (Simpson & Day 2004).

There are few records of the Night Parrot and given its historically capture records, this species is unlikely to occur in the project area.

WC Act 1950

Two bird species potentially occurring in the project area are listed as Scheduled species under the WC Act 1950 (Appendix G4):

- *Pezoporus occidentalis* (Night Parrot); and
- *Falco peregrinus* (Peregrine Falcon).

The potential occurrence of *Pezoporus occidentalis* is discussed above (refer to EPBC Act 1999 section).

Falco peregrinus is listed as Schedule 4 by the DEC and is rated as Least Concern on the IUCN Red List. This species is considered widespread, although uncommon, throughout Australia. *Falco peregrinus* utilises the ledges, cliff faces and large hollows/broken spouts of trees for nesting. This species also occasionally uses the abandoned nests of other birds of prey (Johnstone & Storr 1998). This species was not recorded in previous surveys within the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). *Falco peregrinus* may utilise the project area as part of its foraging territory, however, no suitable sites were identified for nesting.

DEC Priority List

Four bird species (additional to those recorded) potentially occurring in the project area are found under the DEC Priority Fauna List, (Appendix G4):

- *Falco hypoleucos* (Grey Falcon);
- *Burhinus grallarius* (Bush Stone-curlew);
- *Phaps histrionica* (Flock Bronzewing); and
- *Neochmia ruficauda clarescens* (Star Finch).

Falco hypoleucos is listed as Priority 4 by the DEC, as a Migratory species under the EPBC Act 1999 and as Near Threatened under the IUCN Red List. This species was not recorded in previous surveys within the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). *Falco hypoleucos* inhabits woodland areas in arid zones (Simpson & Day 2004), such as the riverine habitat, and may forage in the project area.

Burhinus grallarius is listed as Priority 4 by the DEC and is rated as Near Threatened by the IUCN Red List. *Burhinus grallarius* was not recorded in

previous surveys within the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). This species is known to inhabit open woodlands with groundcover of small sparse shrubs, grass or litter consisting of twigs. It tends to avoid dense forest, closed-canopy habitats (Morcombe 2004). This habitat type is similar to the Riverine and Sandplain habitats present in the project area, and therefore this species is likely to occur.

Phaps histrionica is listed as a Priority 4 species by the DEC and as Least Concern on the IUCN Red List. This species inhabits areas of sparsely wooded grassy plain in close proximity to open water (Johnstone & Storr 1998). This species was not recorded during surveys in the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). *Phaps histrionica* has a low capture record for the area, and is therefore unlikely to occur.

Neochmia ruficauda clarescens is listed as Priority 4 by the DEC and as Near Threatened under the IUCN Red List. *Neochmia ruficauda clarescens* was not recorded during the surveys in the vicinity of the project area (Mattiske Consulting 1994; Biota 2008). This species occurs in sparsely vegetated grasslands near water (Simpson & Day 2004), similar to the Sandplain habitat near Cooliarin Pool. This species' preferred habitat type is represented in the project area, and therefore it is likely to occur.

IUCN Red List

All the bird species potentially occurring in the project area are listed on the IUCN Red List. One species, *Pezoporus occidentalis*, is listed as Critically Endangered. The potential occurrence of *Pezoporus occidentalis* is discussed above (refer to EPBC Act 1999 section).

Four bird species (additional to those recorded) are rated as Near Threatened on the IUCN Red List:

- *Ephippiorhynchus asiaticus* (Jabiru);
- *Falco hypoleucos* (Grey Falcon);
- *Burhinus grallarius* (Bush Stone-curlew); and
- *Neochmia ruficauda clarescens* (Star Finch).

Ephippiorhynchus asiaticus is rated as Near Threatened by the IUCN Red List. This species' preferred habitat is freshwater river pools and lagoons, and pools in estuaries and sheltered bays and salt work ponds (Johnstone & Storr 1998). This species was not recorded during surveys within the vicinity of the project area (Mattiske Consulting 1994 and Biota 2008). *Ephippiorhynchus asiaticus* is likely

to occur in the tidal mudflats and mangroves of the project area because of the area's close proximity to Dampier Salt's salt works and mangrove communities.

The potential occurrence of *Falco hypoleucos*, *Burhinus grallarius* and *Neochmia ruficauda clarescens* is discussed above (refer to DEC Priority List section).

The remaining bird species are rated on the IUCN Red List as Least Concern (Appendix G4). Such taxa are considered widespread and abundant, and not exclusively dependent on the project area at the local level. These species are not protected by legislation.

Locally Significant

Two bird species potentially occurring in the project area are considered of local conservation importance:

- *Stipiturus ruficeps* (Rufous-crowned Emu-wren); and
- *Conopophila whitei* (Grey Honeyeater).

Stipiturus ruficeps and *Conopophila whitei* have restricted distributions south of Port Hedland. *Stipiturus ruficeps* inhabits Sandplains, drainage lines and watercourses with low open vegetation - typically *Triodia* hummock grasslands, whilst *Conopophila whitei*'s preferred habitat is *Acacia* scrubs and thickets (Johnstone & Storr 1998). Both of these vegetation structures exist within the Sandplains habitats, and therefore these species are likely to occur in the project area. None of the aforementioned species were recorded during surveys in the vicinity of the project area (Mattiske Consulting 1994; Biota 2008).

5 DISCUSSION

5.1 FAUNA HABITAT

5.1.1 General

Mangroves, Tidal Flats, Samphire, Dunal, Riverine and Sandplain habitats were recorded within the project area. These habitats have been recorded during other fauna surveys undertaken in the Port Hedland area (e.g. Mattiske Consulting 1994, Biota 2008, 2009) and do not represent unique habitats.

The majority of the project area is located within the Sandplain habitat type, which is considered to be of moderate habitat value. This habitat supports species of conservation significance (e.g. *Aspidites ramsayi*), has a high level of fauna species diversity, has an abundance of microhabitats, and contributed the most animal records in this survey. The vegetation complexity within the Sandplain habitat was limited, with few large trees available for roosting and foraging. The Sandplain habitat is well represented outside of the project area and is not considered to be of conservation significance.

The lack of vegetation structure and ground cover resulted in the Samphire habitat being rated as being of lower habitat value this is due to a lack of microhabitats for fauna to exploit. Migratory birds will use it but to a lesser extent than Tidal Flats and Mangrove habitats. The Samphire habitat is well represented outside of the project area and is not considered to be of conservation significance.

The remaining four habitats were considered to be of high habitat value (see below).

5.1.2 Habitats of Conservation Significance

Four habitats were recorded within the project area which were considered to be high value, and therefore, of conservation significance. These included:

- Mangroves: This habitat support shorebirds and seabirds, many of which are listed as migratory or marine under the EPBC Act 1999.
- Tidal Flats: This habitat support shorebirds and seabirds, many of which are listed as migratory or marine under the EPBC Act 1999.
- Dunal habitat: This habitat may support a unique faunal assemblage and shorebirds and seabirds during high tide, many of which are listed as migratory or marine under the EPBC Act'

- Riverine habitat: This habitat provides important corridors for fauna movement.

5.2 FAUNA ASSEMBLAGES

5.2.1 General

Table 3 presents potentially occurring species with total species recorded for the current survey and the total recorded species for past surveys of the area (Mattiske Consulting 1994).

Table 3: Comparisons of Recorded Fauna

	Mammals	Reptiles	Amphibians	Birds
Fauna species potentially occurring	45	109	10	198
Fauna species recorded in the current survey	25	53	6	115
Potentially occurring species recorded in past surveys	11	23	0	65

NB: Past biological surveys in the vicinity of the project area include Mattiske Consulting (1994)

The current survey compares well with the combined efforts of the previous survey. The current survey recorded a greater number of all potentially occurring faunal groups than the past survey. Previously 11 mammal species, 23 reptile species, no amphibian species, and 65 bird species were recorded (Mattiske Consulting 1994).

5.2.2 Seasonal Comparison of Recorded Fauna

It is important to note seasonal variations when compiling a fauna inventory for environmental impact assessment. Multiple surveys should be conducted across each season appropriate to the bioregion and faunal group (EPA 2004). Previous surveys in the area (i.e. Mattiske Consulting 1994; Hope Downs 2000, 2002; Biota 2004, 2007, 2008) other than the FMG Rail Corridor fauna surveys did not assess seasonality. Therefore a two-season survey will give a more comprehensive indication of faunal assemblages in the project area on a temporal scale.

Two factors determining seasonal faunal activity are rainfall and temperature. Generally, a survey in the season that follows the season of maximum rainfall is the most productive and important survey time (EPA 2004). Therefore a two-phase survey in two different seasons was deemed likely to produce results giving a more comprehensive representation of fauna and faunal assemblages of

the project area. However, because of the low summer rainfall for the area (as few cyclones crossed the Western Australian coast in the 2007-2008 cyclone season), the seasonal differences were not as pronounced as expected. Table 4 shows the species differences between recorded fauna after each season's survey, and these are discussed below.

Table 4: Seasonal Comparisons of Recorded Fauna

	Mammals	Reptiles	Amphibians	Birds
Species recorded in Summer	22	47	4	98
Species recorded in Winter	19	44	5	74
Total species recorded for the survey	25	53	6	115

NB: Percentage figures are percentages of total recorded species.

The greatest variation in seasonal records was observed for birds. The summer survey recorded 39 species not recorded in the winter survey, most of which were non-breeding migratory shorebirds. These animals are temporary residents in spring and summer, and migrate to the northern hemisphere to breed in the Australian autumn and winter (Geering *et al.* 2007). For example, the *Numenius madagascariensis* (Eastern Curlew), *Numenius phaeopus* (Whimbrel), Sandpipers, Stints, *Tringa nebularia* (Common Greenshank) and Terns were all recorded in the tidal mudflats of the project area.

Analysis of the results shows that the seasonal difference in recorded species was not pronounced. The large increase in migratory shorebirds and waders in summer was not unexpected, as these birds are temporary residents in Australia during the summer months. The lack of summer rainfall may have played a part in the limited number of ground-dwelling species recorded in winter, as the abundance of food may have been restricted. Much of the variability is unable to be explained with the data at hand.

Seasonal differences in records of mammals, reptiles and amphibians were not as great as those observed for birds, although slightly higher numbers of mammals and reptiles were observed in summer than winter, possibly due to the higher temperatures, a greater abundance of food due to rainfall, and recent breeding activity.

5.2.3 Fauna of Conservation Significance

Mammals

Mormopterus loriae cobourgensis was not recorded during the surveys in the vicinity of the project area conducted by Hope Downs Management Services Pty Ltd (2002) and Biota (2004). This species was however recorded in both phases of the current fauna survey, foraging in the mangroves of the project area. Given the repeated records of *Mormopterus loriae cobourgensis* in the current survey, this species may roost within the limited mangrove habitat within the Outer Harbour Development project area or surrounding area.

In addition to the *Mormopterus loriae cobourgensis*, there is potential for three other mammal species of conservation significance to occur in the project area. These are *Dasyercus blythi* (Brush-tailed Mulgara), *Rhinionicteris aurantius* (Pilbara Leaf-nosed Bat) and *Leggadina lakedownensis* (Lakeland Downs Mouse). Historic records exist for both the Lakeland Downs Mouse and Brush-tailed Mulgara near Port Hedland (Thompson and Thompson 2008) and they are both supported by the Sandplain habitat type. Known recordings of the Pilbara Leaf-nosed Bat have been made on the Roebourne and Abydos Plain and the potential for this species using the project area for foraging can not be dismissed.

Reptiles

The python, *Aspidites ramsayi* (Woma), was recorded in the winter survey east of the Great Northern Highway near the 2008 rail option (Figure 10). This species was not recorded during the fauna surveys conducted by Mattiske Consulting (1994) and Biota (2008). However, *Aspidites ramsayi* was recorded twice within 35 km of Port Hedland during the Hope Downs rail corridor survey (Hope Downs Management Services 2002).

Birds

Ardeotis australis (Australian Bustard) has been recorded at a variety of locations in the Abydos Plain (Biota 2002), and was recorded at Boodarie by Mattiske Consulting (1994) and further afield at surveys conducted by Hope Downs Management Services Pty Ltd (2002) and Biota (2004). *Ardeotis australis* was also recorded in both phases of the current survey. *Numenius madagascariensis* was recorded by Mattiske Consulting (1994) and Hope Downs Management Services Pty Ltd (2002) in the broad surveys of the area, and was recorded only in the summer phase of the current survey.

Birds Australia (2008) has compiled a list of the 30 most commonly recorded shorebird species in Western Australia, of which 21 species were recorded during the current survey (Appendix L). Furthermore, the current survey recorded two shorebird species not previously recorded by Birds Australia for this region:

- *Actitis hypoleucos* (Common Sandpiper); and
- *Elseyornis melanops* (Black-fronted Dotterel).

Actitis hypoleucos is a relatively cryptic wading species that is often missed during wading surveys. *Elseyornis melanops* is an inland freshwater wading species that was recorded near a quarry during the current survey, and is unlikely to have been recorded near Birds Australia survey sites at Port Hedland and Finucane Island (pers. comm., M. Welsh, ENV).

6 IMPACT ASSESSMENT

6.1 OVERVIEW

Hazards associated with the proposed Outer Harbour Development and the potential impacts on terrestrial fauna that may result are summarised in Table 5.

Table 5: Potential Impacts on Terrestrial Fauna from the project

Hazard	Source	Potential Impact
Clearing and Earthworks	Construction of terrestrial infrastructure (transfer pad, infrastructure corridor, stockyards, rail)	<ul style="list-style-type: none"> • Direct loss of general habitat and habitats of conservation significance may reduce the resources available for the local fauna community (e.g. nesting sites, foraging territory), and in particular for rare or threatened species. • Direct loss of or injury to general fauna and fauna of conservation significance through vehicle strikes or squashing of fauna by machinery. Loss of habitat outside of the disturbance envelope due to accidental clearing. • Degradation to fauna habitat due to unrestricted vehicle access. • Removal of habitat increases pressure on native species through competition and predation.
Physical presence of infrastructure	Construction and operation of terrestrial facilities	<ul style="list-style-type: none"> • Disturbance of fauna movement corridors associated with riparian habitats. • Reduction in the dispersal ability of animal species between remnant habitats on either side of the proposed rail corridor. Segmentation of habitat. • Fauna may avoid habitat areas near constructed infrastructure.
Fire	Vehicle exhaust and construction and operation of terrestrial facilities	<ul style="list-style-type: none"> • Direct loss of habitat or fauna inside and outside of the disturbance envelope.
Dust	Vehicle movements and	<ul style="list-style-type: none"> • Dust can result in secondary impacts on fauna through reducing habitat quality, condition and

Hazard	Source	Potential Impact
	construction and operation of the facility	availability.
Noise	Construction and Operation of terrestrial facilities	<ul style="list-style-type: none"> • Increased noise may cause added stress on breeding populations of fauna species. • Increased noise may deter fauna.
Artificial lighting	Construction and Operation of terrestrial facilities	<ul style="list-style-type: none"> • Light spill may deter some fauna (e.g. birds) whilst attracting others (e.g. bats in response to increases in insects).
Uncontrolled discharge of wastes or chemicals	Domestic waste, hydrocarbons or chemicals	<ul style="list-style-type: none"> • Loss of or injury to fauna as a result of accidental ingestion or entanglement. • Spread of vermin leading to increased competition or predation with fauna. • Degradation to fauna habitat.
Physical interaction e.g. traffic	Vehicle and equipment movements	<ul style="list-style-type: none"> • Increased traffic may result in increased fauna mortality (e.g. vehicle strikes) .

6.2 IMPACTS ON HABITAT

The majority of the proposed disturbance envelope affects the Sandplain habitat. Clearing associated with the construction of the proposed rail spur, rail loop and stockyards will result in the direct loss of sandplain habitat. This habitat type is not of conservation significance value, as it is well represented outside the project area. The project will not affect the broad representation of the Sandplain habitat in the region it is unlikely there will be significant reduction in fauna resources through clearing of this habitat.

Clearing associated with the construction of the proposed conveyor and transfer pad will impact upon the Mangroves, Tidal Flats, and Dunal systems within the project area and construction of the rail spur will impact on localised areas of Riverine habitat (Figure 2). With exception of mangroves, these habitats are generally well-represented in the local Port Hedland area outside of the proposed disturbance envelope. It is unlikely there will be significant reduction in fauna resources through clearing of these habitats. A separate assessment has been undertaken to specifically examine potential impacts on mangroves (SKM 2009).

One quartz outcrop will be impacted through the construction of the proposed Western Spur Railway. This microhabitat is also present outside of the proposed disturbance envelope and is not considered to be of conservation significance.

6.3 IMPACTS ON FAUNA

Of the 199 recorded species for the project area, 25 are protected by legislation (i.e. listed under the EPBC Act 1999, and/or the WC Act 1950). Species under legislation and/or the DEC Priority Listing during the current survey will be discussed.

The python *Aspidites ramsayi* (Woma) inhabits spinifex within woodlands, heaths and shrublands (Wilson & Swan 2003). It is restricted to arid areas, where it shelters in hollow logs, animal burrows or thick vegetation (Cogger 2000). Even though direct habitat loss may result in localised mortalities, the broad representation of this species in the region is not likely to be compromised by the project.

Mormopterus loriae cobourgensis (the Little North-western Freetail Bat) was recorded in both phases of the fauna survey, foraging in the mangroves of the project area (pers. comm., R. Bullen). This species inhabits mangrove communities, roosting in crevices and spouts of the dead upper branches of the mangrove *Avicennia marina* (Strahan 1995). Therefore further removal of this type of habitat will have the potential to impact on this species at the local level. However, as the proposed area of mangroves to be cleared is small, the project is not expected to impact *Mormopterus loriae cobourgensis* population numbers at a regional level.

Ardeotis australis (the Australian Bustard) inhabits woodlands and grasslands, moving widely over large areas (Johnstone & Storr 1998). This species has been recorded at a variety of locations in the Abydos Plain (Biota 2002). The Australian Bustard was recorded from the Sandplain habitat during both seasons of the current survey. Because of its nomadic behaviour and the fact that it is not reliant on habitats in the project area, the project is not expected to affect this species.

Numenius madagascariensis (the Eastern Curlew) mainly inhabits Tidal Flats and Mangrove areas, and is also known to occur in Dunal habitat. This species was recorded only in the summer season in the above habitats. This species is not specifically reliant on habitat within the disturbance envelope and therefore its broad representation within the region is not expected to be compromised.

Twenty-two bird species recorded during the survey are listed as Migratory species under the EPBC Act 1999. Most of these species were recorded within Mangroves and Tidal Flats habitat types. These habitat types support most of the migratory waders found in the project area, and many of these non-breeding migrants will use these habitats for foraging and roosting during the summer. Many of these are largely aerial species with an extensive home range, and will not be reliant on habitats in the project area. During low tide, these species can disperse throughout tidal mudflats of the project area to roost and forage. At high tide they converge and roost at one location at the far south-western tip of Finucane Island. This location is not within the proposed disturbance envelope.

Eight species of conservation significant fauna potentially occur in the project area that were not recorded in the survey. These species are *Dasycercus blythi*, *Leggadina lakedownensis*, *Rhinonictes aurantius*, *Ramphotyphlops ganei*, *Falco peregrinus*, *Falco hypoleucos*, *Burhinus grallarius*, and *Neochmia ruficauda clarescens*. Of these species, breeding habitat is only present for *Burhinus grallarius*, and *Neochmia ruficauda clarescens*. However, *Burhinus grallarius* breeds in Sandplain and open woodland areas, which are well represented outside of the proposed disturbance envelope; and *Neochmia ruficauda clarescens* is restricted to permanent water bodies, such as Cooliarin Pool, which are not present within the proposed disturbance envelope.

The remaining potentially occurring fauna of conservation significance are likely to only use the habitat for foraging. They are not depended on any specific habitats in the project area and are unlikely to be impacted by the development.

7 CONCLUSIONS

Of the six habitats identified broadly across the project area, the Dunal, Riverine, Mangrove and Tidal Flat habitats were identified as being of high value in supporting fauna, and are therefore considered to be of conservation significance. However, on a regional scale, the significance of the habitats is not sufficient to warrant the alteration of the disturbance envelope. The proposed Outer Harbour Development will not affect the regional representation of recorded habitats of conservation significance or recorded or potentially occurring fauna of conservation significance.

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STATEMENT OF LIMITATIONS

Scope of Services

This environmental site assessment report ('the report') has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed between the Client and ENV. Australia Pty Ltd (ENV) ('scope of services'). In some circumstances the scope of services may have been limited by factors such as time, budget, access and/or site disturbance constraints.

Reliance on Data

In preparing the report, ENV has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise stated in the report, ENV has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. ENV will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to ENV.

Environmental Conclusions

In accordance with the scope of services, ENV has relied on the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, express or implied, is made.

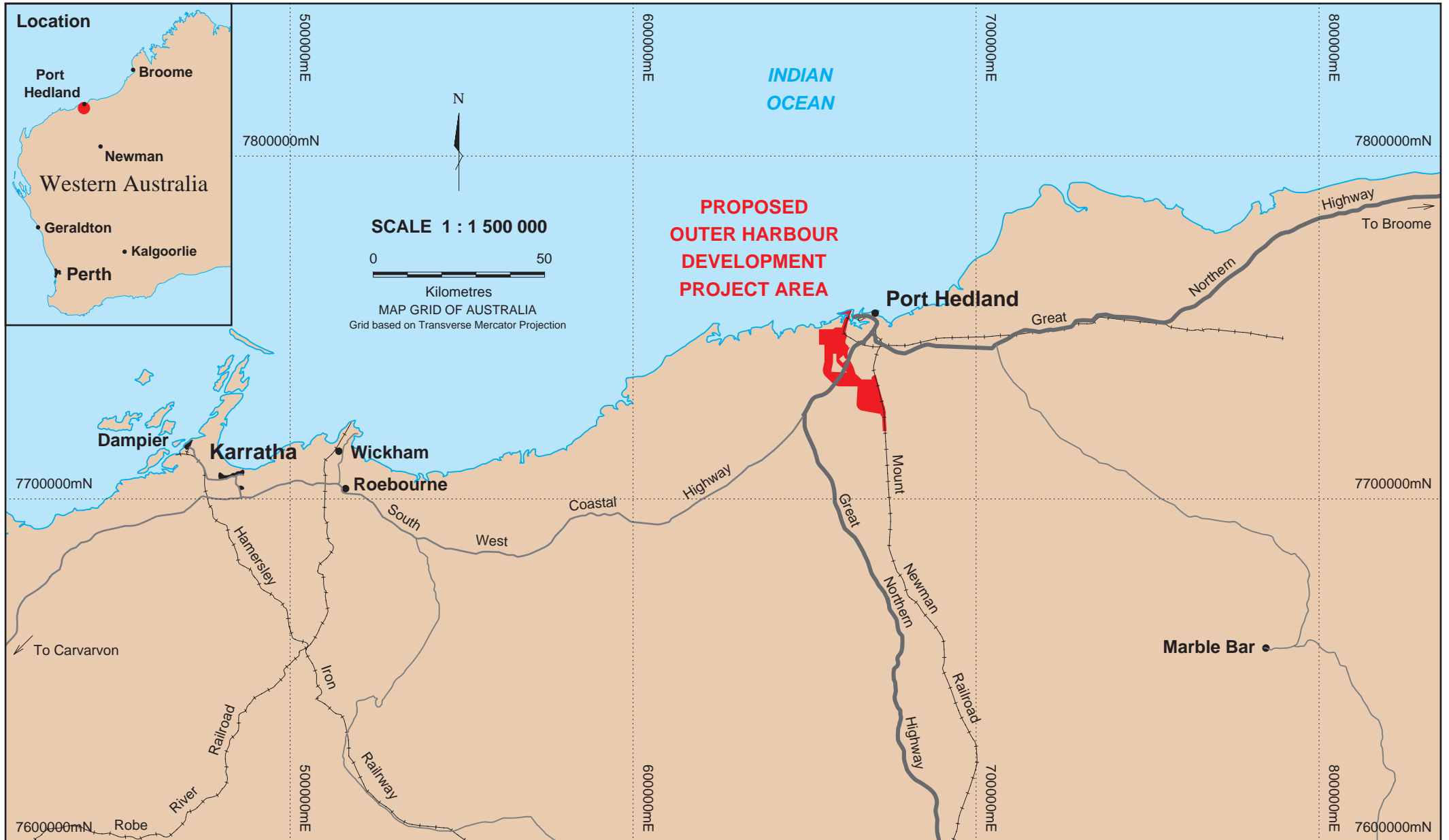
Report for Benefit of Client

The report has been prepared for the benefit of the Client and for no other party. ENV assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of ENV or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely on the report or the accuracy or completeness of any conclusions, and should make their own enquiries and obtain independent advice in relation to such matters.

Other Limitations

ENV will not be liable to update or revise the report to take into account any events or circumstances occurring or becoming apparent after the date of the report, or facts becoming apparent or available after the date of the report.

FIGURES

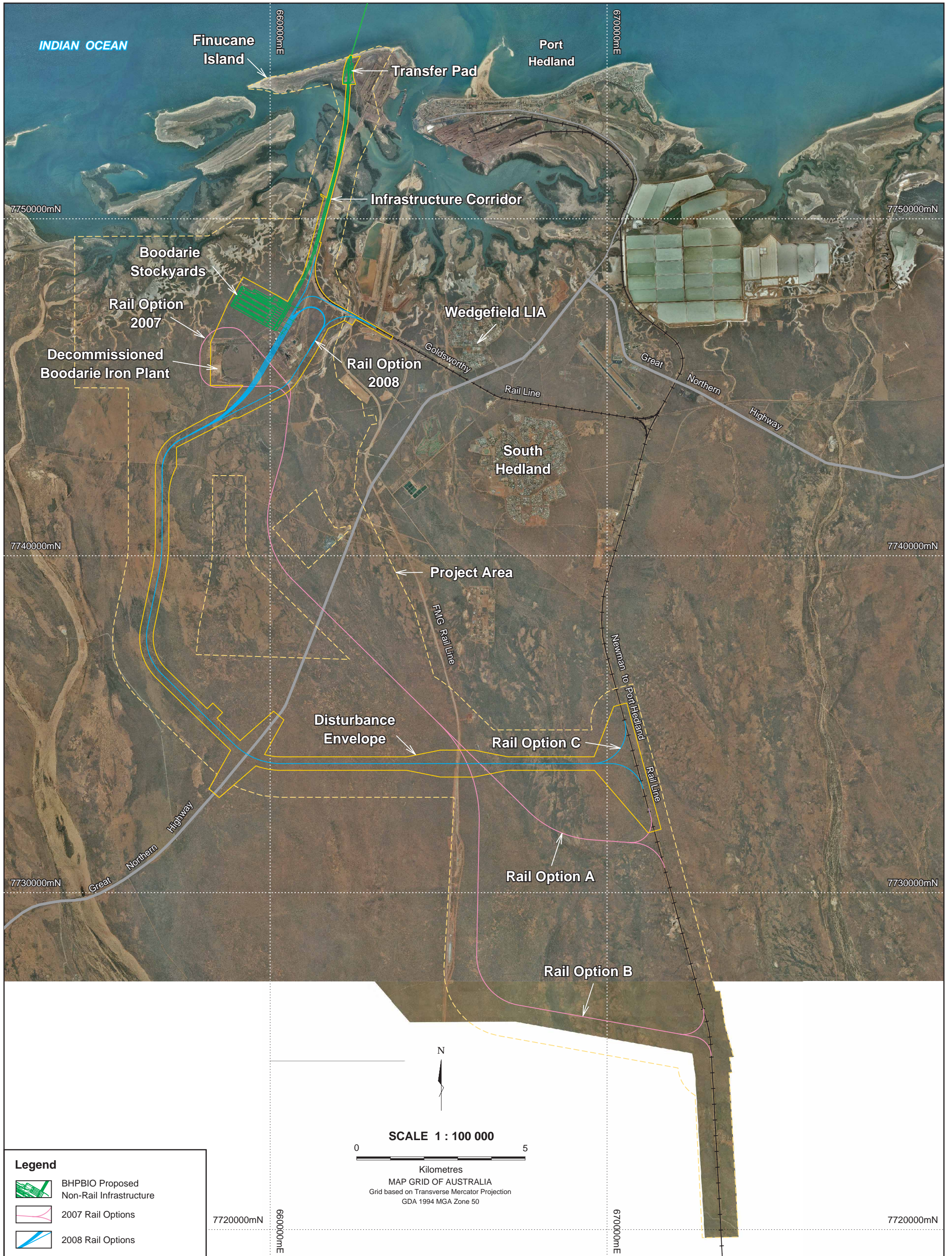





Author: M.Love
 Drawn: S.Coleman
 Status:
 Job Number: 08.216

Client: **BHP BILLITON PTY LTD**
 Project: **OUTER HARBOUR DEVELOPMENT
 FAUNA ASSESSMENT**

REGIONAL LOCATION

Date: 14 September 2009
 Scale: 1: 1.5 Million
 Figure No. **1**
 Plan No. **QM-001**



- Legend**
-  BHPBio Proposed Non-Rail Infrastructure
 -  2007 Rail Options
 -  2008 Rail Options

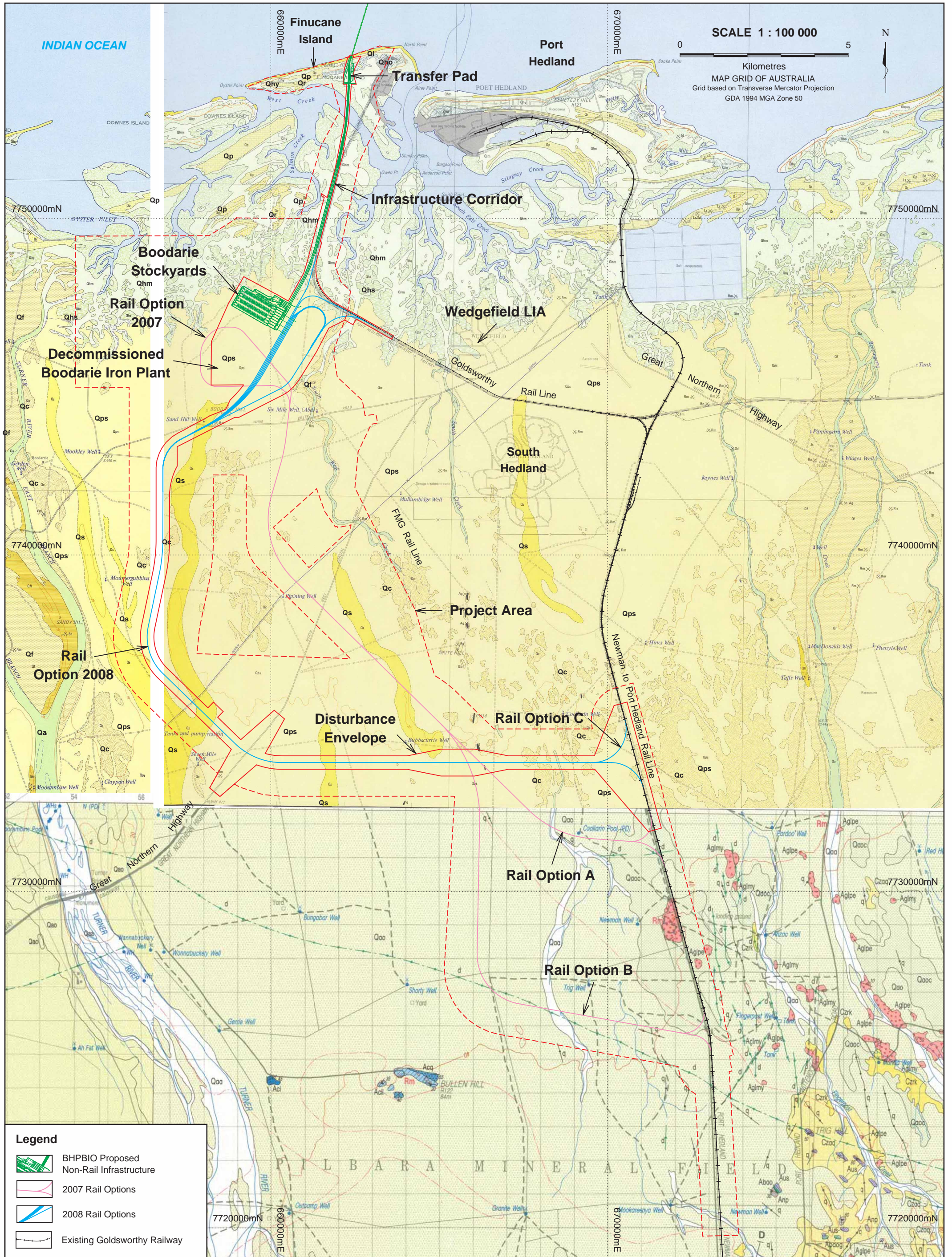
 Author: M.Brown
 Drawn: S.Coleman
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 Job Number: 08.216

Client: **BHP BILLITON PTY LTD**
 Project: **OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT**

PROPOSED INFRASTRUCTURE

Date: 27 November 2009
 Scale: 1:100 000
 Figure No. **2**
 Plan No. **QM-016**

A3



- Legend**
- BHPBIO Proposed Non-Rail Infrastructure
 - 2007 Rail Options
 - 2008 Rail Options
 - Existing Goldsworthy Railway

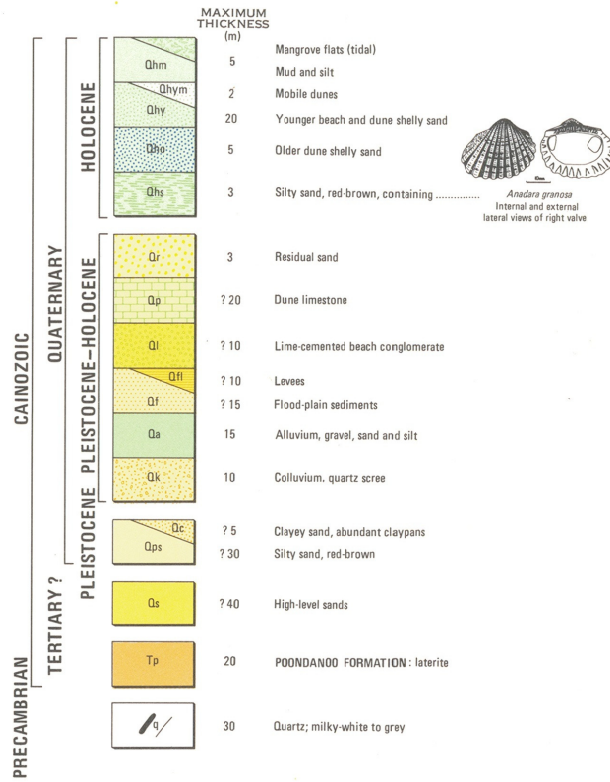
Author: M.Brown
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 Status:
 Job Number: 08.216

Client: **BHP BILLITON PTY LTD**
 Project: **OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT**

REGIONAL GEOLOGY

Date: 27 November 2009
 Scale: 1:100 000
 Figure No. **5a**
 Plan No. **QM-018**

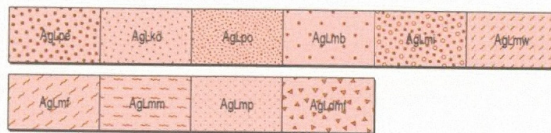
**1:50 000
Geology Legend
2557-2 (Boodarie)
2657-3 (Port Hedland)**



**1:100 000
Geology Legend
2556 (Yule)
2656 (Wallingara)**



- Qaa Alluvial sand and gravel in rivers and creeks; clay, silt, and sand in channels on floodplains
- Qac Clay and silt in claypan deposits on floodplains
- Qao Alluvial sand, silt, and clay on floodplains
- Qooc Mixed floodplain deposits with numerous small claypans
- Qob Alluvial sand, silt, and clay in floodplains, with gylgal surface in areas of expansive clay
- Qw Sheetwash deposits — silt, sand, and pebbles on distal outwash fans; no defined drainage
- Qc Colluvium — sand, silt, and gravel in outwash fans; scree and talus; proximal mass-wasting deposits
- Qrg Quartzfeldspathic eluvial sand with quartz and rock fragments; overlying and derived from granitoid rock



- CARLINDI GRANITOID COMPLEX**
- AgLpe Pegmatite; metamorphosed
 - AgLkd KADGEWARRINA MONZOGANITE: muscovite-biotite(-garnet) monzogranite; equigranular to weakly porphyritic; massive to weakly foliated; metamorphosed
 - AgLpo POOCATCHE MONZOGANITE: muscovite-biotite monzogranite; seriate to porphyritic; massive to weakly foliated; locally abundant pegmatite; metamorphosed
 - AgLmb Fine- to coarse-grained muscovite-biotite monzogranite; massive to weakly foliated; metamorphosed
 - AgLmi MINNAMONICA MONZOGANITE: porphyritic biotite-muscovite monzogranite; fine- to coarse-grained; quartz and K-feldspar phenocrysts; massive to weakly foliated; metamorphosed
 - AgLmw Biotite(-muscovite) monzogranite, equigranular to weakly K-feldspar porphyritic; locally highly leucocratic and ghost-banded; massive to weakly foliated; metamorphosed
 - AgLmf Biotite monzogranite, strongly foliated; seriate to K-feldspar porphyritic; related to AgLmp; metamorphosed
 - AgLmm Mylonitized monzogranite; related to AgLmp; metamorphosed
 - AgLmp Biotite monzogranite, porphyritic (K-feldspar) to seriate; massive to weakly foliated; locally strong flow-alignment; metamorphosed
 - AgLdmf Diorite, granodiorite, monzogranite, and abundant felsic to mafic inclusions and dykes, strongly foliated; metamorphosed



CLEAVERVILLE FORMATION

- AGlc Chert; metamorphosed
- AGlcw Chert; weakly banded, grey and white; metamorphosed
- AGli Banded iron-formation; locally includes banded quartz-magnetite-grunerite rock; metamorphosed
- AGls Metamorphosed, fine- to medium-grained wacke; locally interleafed with serpentine- and tremolite-rich schist and metamorphosed iron-formation and ferruginous siltstone



- As Sedimentary rock, undivided; metamorphosed
- Aci Banded iron-formation; locally includes banded quartz-magnetite-grunerite rock; metamorphosed
- Acl Banded iron-formation; strongly recrystallized and limonitized
- Aca Banded white and grey chert, and quartzite; local minor jaspillite and iron formation; locally includes banded quartz-grunerite rock; metamorphosed
- Anp Paragneiss; medium-grained, strongly recrystallized sedimentary rock



Client: **BHP BILLITON PTY LTD**

Project: **OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT**

GEOLOGY LEGEND

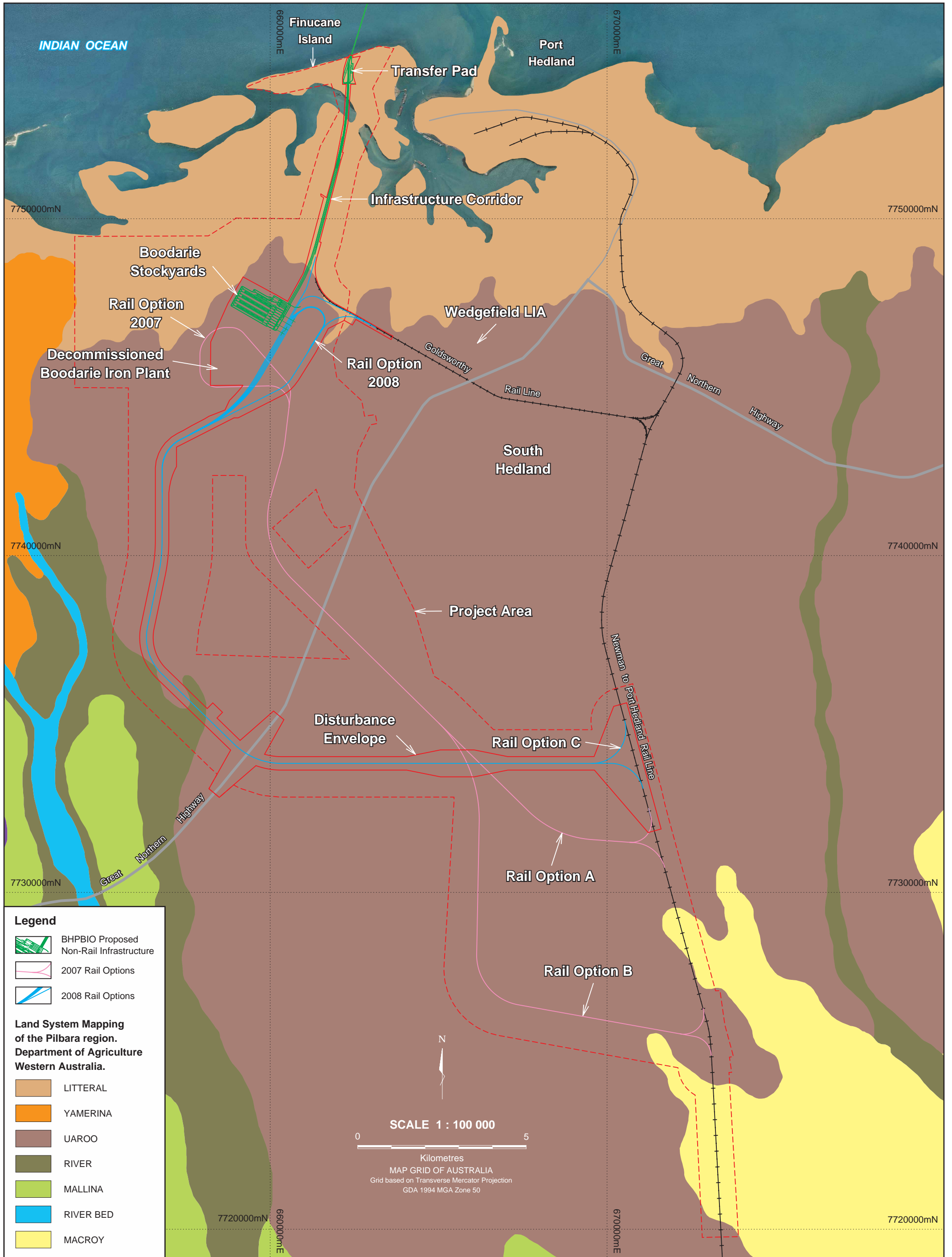
Date: 16 January 2009




Scale: NTS

Author: M.B. / S.C.








Figure No. **5b**

Plan No. **QM-021**



- Legend**
-  BHPBIO Proposed Non-Rail Infrastructure
 -  2007 Rail Options
 -  2008 Rail Options

Land System Mapping of the Pilbara region. Department of Agriculture Western Australia.

-  LITTERAL
-  YAMERINA
-  UAROO
-  RIVER
-  MALLINA
-  RIVER BED
-  MACROY

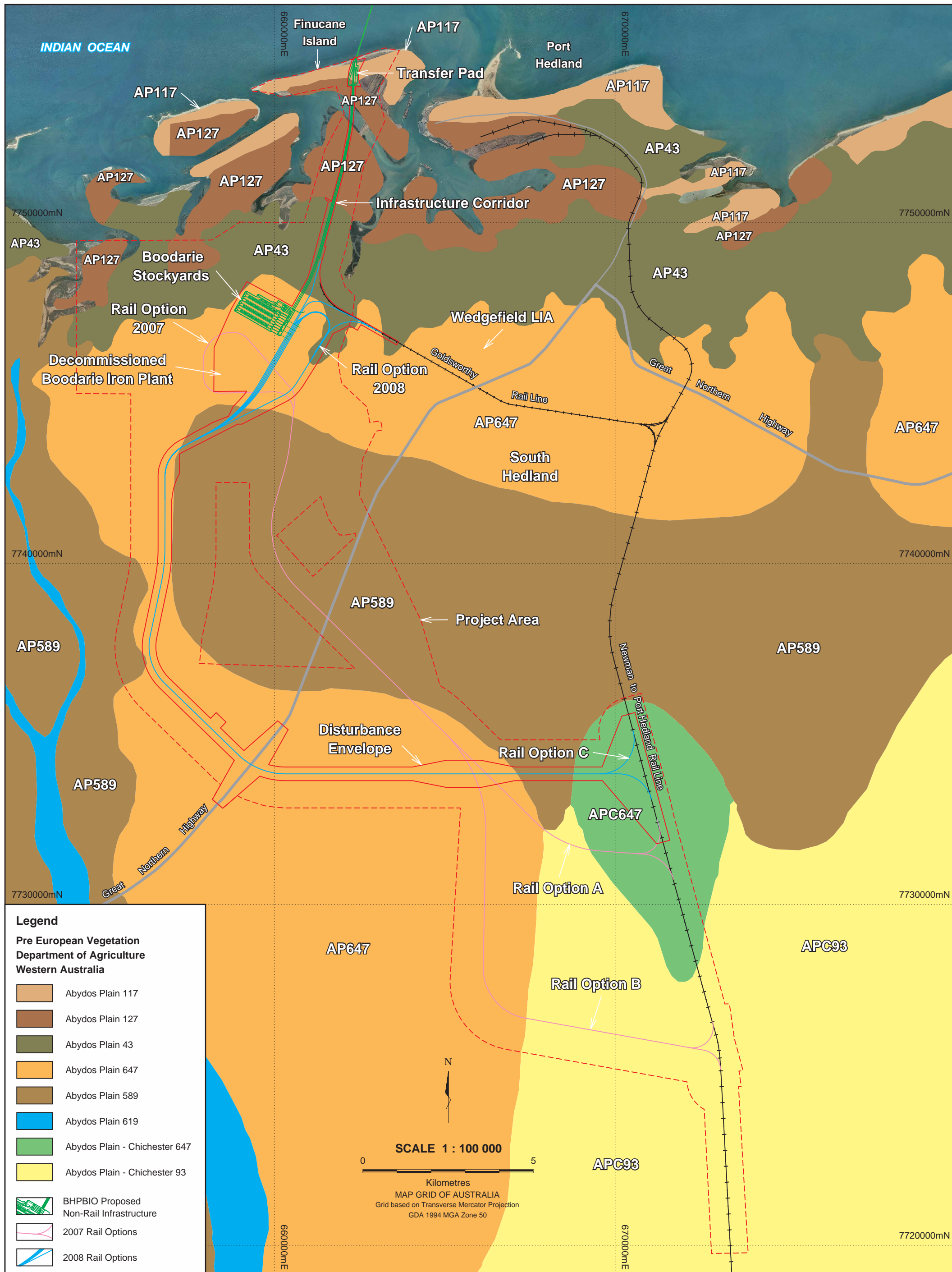


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 Status:
 Job Number: 08.216

Client: **BHP BILLITON PTY LTD**
 Project: **OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT**

LAND SYSTEM MAPPING

Date: 27 November 2009
 Scale: 1:100 000
 Figure No. **6**
 Plan No. **QM-019**

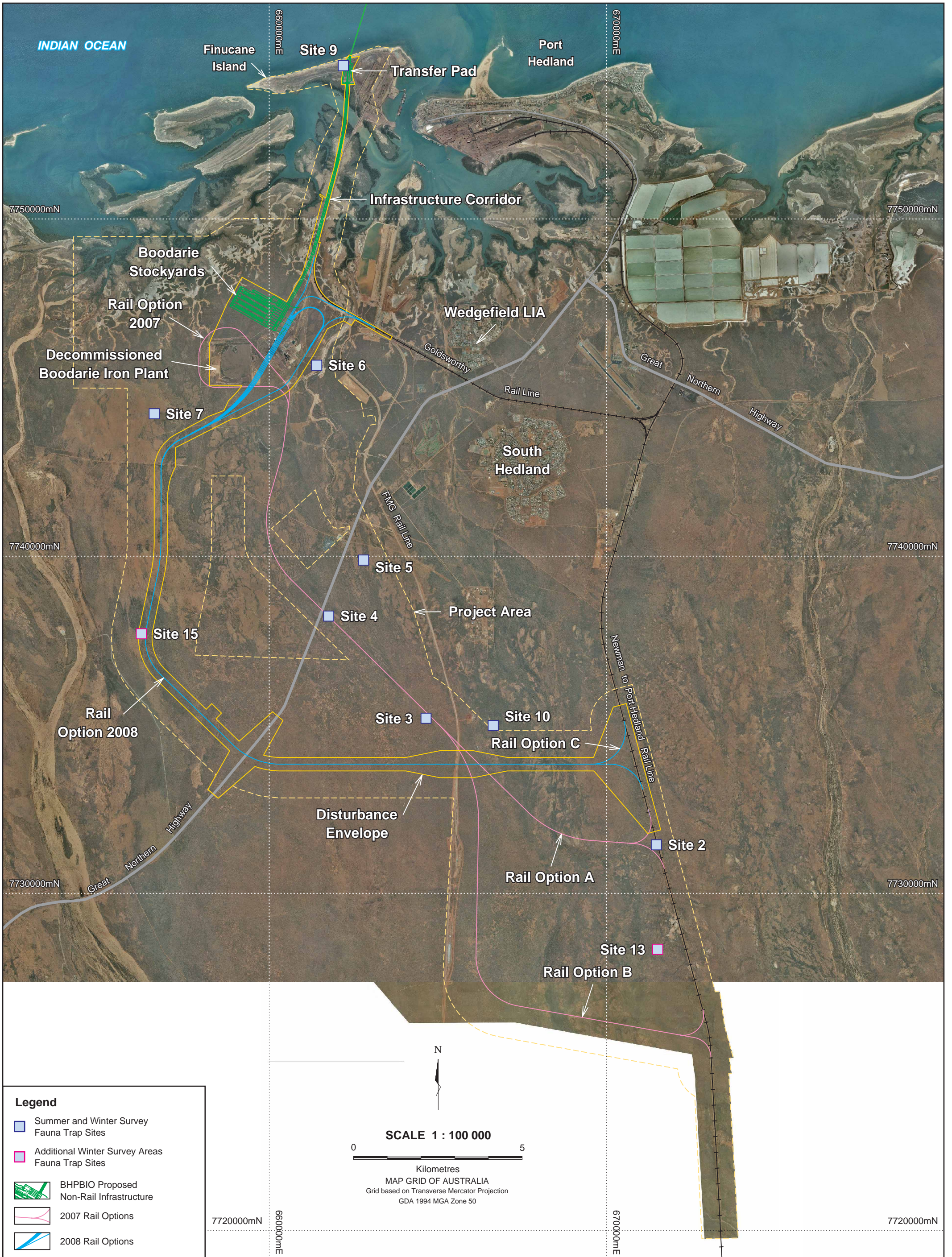


Author: M.Brown
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 Status:
 Job Number: 08.216

Client: **BHP BILLITON PTY LTD**
 Project: **OUTER HARBOUR DEVELOPMENT
 FAUNA ASSESSMENT**

REGIONAL VEGETATION

Date: 27 November 2009
 Scale: 1:100 000
 Figure No. **7**
 Plan No. **QM-020**



Legend	
	Summer and Winter Survey Fauna Trap Sites
	Additional Winter Survey Areas Fauna Trap Sites
	BHPBIO Proposed Non-Rail Infrastructure
	2007 Rail Options
	2008 Rail Options

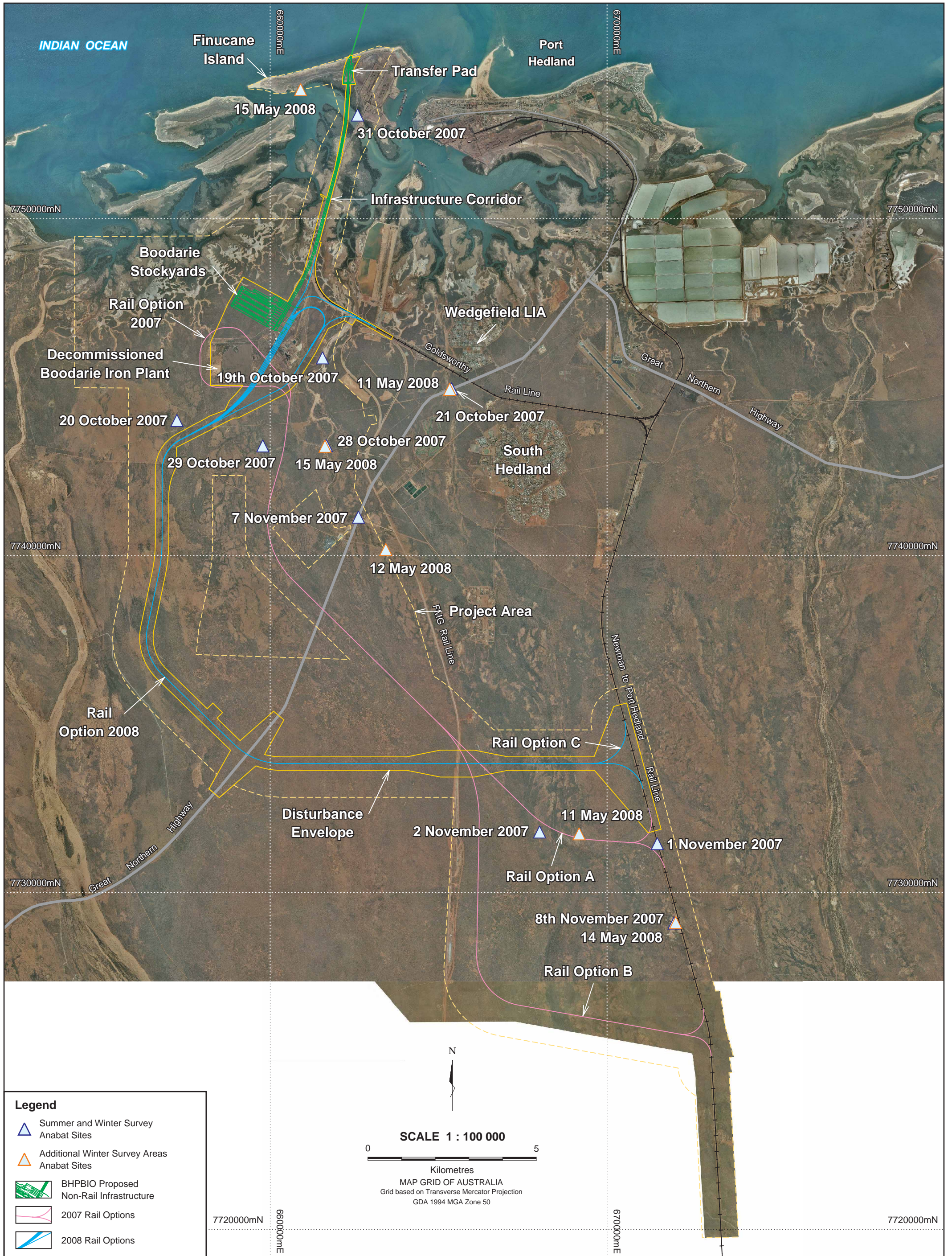
	Author: M.Brown
	Drawn: S.Coleman
	Status:
	Job Number: 08.216

Client: BHP BILLITON PTY LTD
Project: OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT






TRAP SITE LOCATIONS	
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Date: 27 September 2009
Scale: 1:100 000
Figure No. 8
Plan No. QM-005

A3



Legend

-  Summer and Winter Survey Anabat Sites
-  Additional Winter Survey Areas Anabat Sites
-  BHPBIO Proposed Non-Rail Infrastructure
-  2007 Rail Options
-  2008 Rail Options

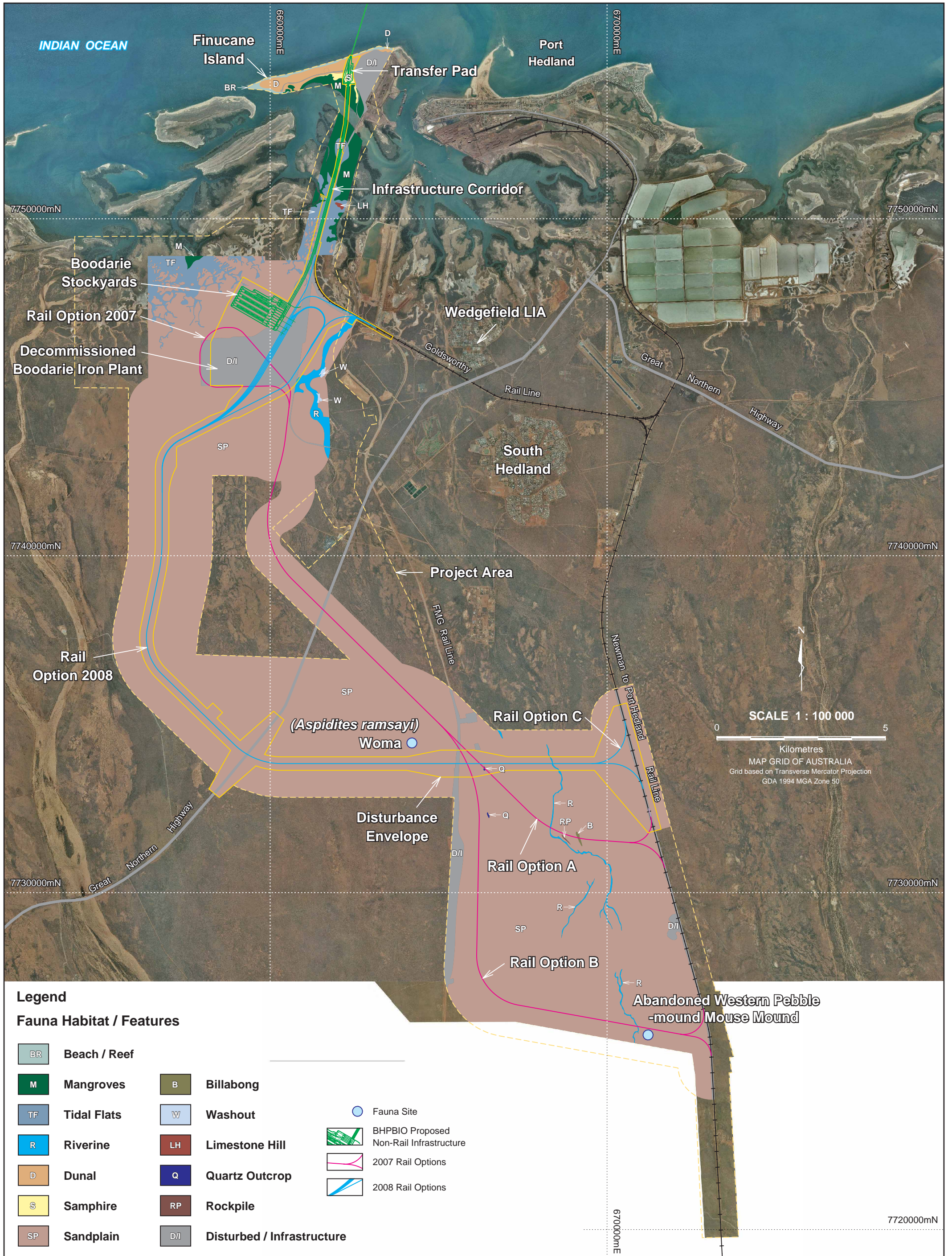


Author: M.Brown
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 Status:
 Job Number: 08.216

Client: **BHP BILLITON PTY LTD**
 Project: **OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT**

ACCOUSTIC BAT RECORDING LOCATIONS

Date: 27 September 2009
 Scale: 1:100 000
 Figure No. **9**
 Plan No. **QM-006**



Legend
Fauna Habitat / Features

- | | | | | |
|-----------|---------------------|------------|-----------------------------------|--|
| BR | Beach / Reef | B | Billabong | Fauna Site |
| M | Mangroves | W | Washout | BHPBIO Proposed Non-Rail Infrastructure |
| TF | Tidal Flats | LH | Limestone Hill | 2007 Rail Options |
| R | Riverine | Q | Quartz Outcrop | 2008 Rail Options |
| D | Dunal | RP | Rockpile | |
| S | Samphire | D/I | Disturbed / Infrastructure | |
| SP | Sandplain | | | |

SCALE 1 : 100 000
 0 5
 Kilometres
 MAP GRID OF AUSTRALIA
 Grid based on Transverse Mercator Projection
 GDA 1994 MGA Zone 50

APPENDIX A

DEFINITION OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX A

Definition of Conservation Codes for Fauna of Conservation Significance

Environment Protection and Biodiversity Conservation Act 1999 (Cth) Threatened Species and Threatened Ecological Communities Codes

The EPBC Act prescribes seven matters of national environmental significance:-

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance;
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

Species in the categories ExW, CE, E, E and V (see below), and threatened ecological communities in the CE and E categories are protected as matters of national environmental significance under the EPBC Act.

Category Code	Category
Ex	<p>Extinct</p> <p>Taxa for which there is no reasonable doubt that the last member of the species has died.</p>
ExW	<p>Extinct in the Wild</p> <p>Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or not recorded in its known and/or expected habitat at appropriate seasons anywhere in its past range despite exhaustive surveys over a timeframe appropriate to its life cycle and form.</p>
CE	<p>Critically Endangered</p> <p>Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.</p>
E	<p>Endangered</p> <p>Taxa not critically endangered and facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.</p>
V	<p>Vulnerable</p>

	<p>Taxa not critically endangered or endangered and facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.</p>
CD	<p>Conservation Dependent</p> <p>Taxa which are the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within five years.</p>
Mi	<p>Migratory</p> <p>Taxa that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations, that are included in an international agreement approved by the Minister for the Environment, Heritage and the Arts and that have been placed on the national List of Migratory Species under the provisions of the EPBC Act. At present there are four such agreements:</p> <ul style="list-style-type: none"> • the Bonn Convention • the China-Australia Migratory Bird Agreement (CAMBA) • the Japan-Australia Migratory Bird Agreement (JAMBA) • the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
Ma	<p>Marine</p> <p>Taxa protected in a Commonwealth Marine Protected Area by virtue of section 248 of the EPBC Act. These taxa include certain seals, crocodiles, turtles and birds, as well as various marine fish.</p> <p>Commonwealth marine areas are matters of national environmental significance under the EPBC Act.</p> <p>An action will require approval if the:</p> <ul style="list-style-type: none"> • action is taken in a Commonwealth marine area and the action has, will have, or is likely to have a significant impact on the environment, or • action is taken outside a Commonwealth marine area and the action has, will have, or is likely to have a significant impact on the environment in a Commonwealth marine area¹ <p>The Commonwealth marine area is 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, that is not State or Northern Territory waters.</p> <p>The Commonwealth marine area stretches from 3 to 200 nautical miles from the coast. Marine protected areas are marine areas which are recognised to have high conservation value.</p>

Wildlife Conservation Act 1950 (WA)

Category	Code	Description
Schedule 1	S1	Rare or likely to become extinct.
Schedule 2	S2	Presumed extinct.
Schedule 3	S3	Birds subject to an agreement between the governments of Australia and Japan, the People's Republic of China & the Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.
Schedule 4	S4	Other specially protected fauna.

Department of Environment and Conservation (DEC) Fauna Priority Codes

Category	Code	Description
Priority 1	P1	Taxa with few, poorly known populations on threatened lands.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	P4	Taxa in need of monitoring: not currently threatened or in need of special protection, but could become so. Usually represented on conservation lands.
Priority 5	P5	Taxa in need of monitoring: not considered threatened, but the subject of a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

IUCN Red List of Threatened Species Codes

Category	Code	Description
Extinct	EX	Taxa for which there is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range, and not recorded in known or expected habitat despite exhaustive survey over a timeframe appropriate to its lifecycle and form.
Critically endangered	CR	Taxa facing an extremely high risk of extinction in the wild.
Endangered	EN	Taxa facing a very high risk of extinction in the wild.
Vulnerable	VU	Taxa facing high risk of extinction in the wild
Near threatened	NT	Taxa which have been evaluated and do not qualify for CR, EN, or VU, but are close to qualifying or likely to qualify in the near future.
Least Concern	LC	Taxa which have been evaluated and do not qualify for CR, EN, VU or NT, but are likely to qualify for NT in the near future.
Data deficient	DD	Taxa for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

International conventions and agreements

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)

This is an intergovernmental treaty under the United Nations Environmental Program which lists migratory species that would significantly benefit from international cooperation on their conservation and management.

Japan-Australia Migratory Bird Agreement (JAMBA)

This is an agreement between the Government of Australia and the Government of Japan for the protection of migratory, threatened and birds in danger of extinction. It requires both parties to conserve and protect the birds and their habitats as well as exchange information and build a cooperative relationship.

China-Australia Migratory Bird Agreement (CAMBA)

This is an agreement between the Government of Australia and the Government of the People's Republic of China for the protection of migratory birds and their environment. It requires both parties to conserve and protect the birds and their habitats as well as exchange information and build a cooperative relationship.

APPENDIX B

TRAPPING PROGRAM

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX B

TRAPPING PROGRAM

Appendix B1 – Trap Site Locations for Summer Survey

Site	#GPS Coordinates	
	Easting	Northing
Site 2 – Start	671526	7731265
Site 2 – End	671425	7731615
Site 3 – Start	664747	7735183
Site 3 - End	664551	7735203
Site 4 – Start	661639	7738270
Site 4 - End	661887	7738177
Site 5 - Start	662788	7739999
Site 5 - End	662805	7739770
Site 6 - Start	661418	7745816
Site 6 - End	661398	7745509
Site 7 - Start	656473	7744246
Site 7 - End	656708	7744201
Site 9 - Start	662156	7754542
Site 9 - End	662240	7754547
Site 10 - Start	666721	7734911
Site 10 - End	666558	7735047

Australian Geocentric 1994 (GDA94), Zone 50K.

Appendix B2 – Major Habitat Types and Vegetation Descriptions of Trap Sites for Summer Survey

Site Number	Habitat Type	Vegetation Description
2	Roadside Verge	An open <i>Acacia</i> shrubland over a <i>Triodia</i> hummock grassland.
3	Sand Plain	Scattered mixed <i>Acacia</i> shrubs over a low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
4	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
5	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
6	Tidal Drainage Line	Low <i>Eucalyptus</i> woodland over an <i>Acacia tumida</i> shrubland over a mixed herbland and mixed grassland. Some areas of Samphire.
7	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
9	Sand Dune	Scattered <i>Crotalaria cunninghamii</i> shrubs over a <i>*Cenchrus ciliaris</i> grassland.
10	Riverine	A low open <i>Eucalyptus</i> woodland over a mixed shrubland over a mixed herbland.

Appendix B3 – Traps and Number of Replicates Used at Each Trap Site for Summer Survey

Site Number	# Cage Traps	# Elliott Traps	# Funnel Traps	# Bucket Traps	# Pot Traps	# Long Pot Traps	Total
2	8	8	16	8	5	3	48
3	8	8	16	8	5	3	48
4	8	8	16	8	5	3	48
5	8	8	16	8	5	3	48
6	8	8	16	8	5	3	48
7	8	8	16	8	5	3	48
9	8	8	16	8	5	3	48
10	8	8	16	8	5	3	48
TOTAL	64	64	128	64	40	24	384

Appendix B4 – Systematic Trapping Program for Summer Survey

Site Number	# nights Cage Traps	# nights Elliott Traps	# nights Funnel Traps	# nights Bucket Traps	# nights Pot Traps	# nights Long Pot Traps	Total nights
2	64	64	128	64	128	24	472
3	64	64	128	64	128	24	472
4	64	64	128	64	128	24	472
5	64	64	128	64	128	24	472
6	64	64	128	64	128	24	472
7	64	64	128	64	128	24	472
9	64	64	128	64	128	24	472
10	64	64	128	64	128	24	472
TOTAL	512	512	1024	512	1024	192	3776

Appendix B5 – Trap Site Locations for Winter Survey

Site	#GPS Coordinates	
	Easting	Northing
Site 2 – Start	671526	7731265
Site 2 – End	671425	7731615
Site 3 – Start	664747	7735183
Site 3 - End	664551	7735203
Site 4 – Start	661639	7738270
Site 4 - End	661887	7738177
Site 5 - Start	662788	7739999
Site 5 - End	662805	7739770
Site 6 - Start	661418	7745816
Site 6 - End	661398	7745509
Site 7 - Start	656473	7744246
Site 7 - End	656708	7744201
Site 9 - Start	662156	7754542

Site	#GPS Coordinates	
	Easting	Northing
Site 9 - End	662240	7754547
Site 10 - Start	666721	7734911
Site 10 - End	666558	7735047
Site 13 - Start	671538	7728188
Site 13 - End	671493	7728494
Site 15 - Start	656180	7737766
Site 15 - End	656238	7737631

Australian Geocentric 1994 (GDA94), Zone 50K.

Appendix B6 – Major Habitat Types and Vegetation Descriptions of Trap Sites for Winter Survey

Site Number	Habitat Type	Vegetation Description
2	Roadside Verge	An open <i>Acacia</i> shrubland over a <i>Triodia</i> hummock grassland.
3	Sand Plain	Scattered mixed <i>Acacia</i> shrubs over a low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
4	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
5	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
6	Tidal Drainage Line	Low <i>Eucalyptus</i> woodland over an <i>Acacia tumida</i> shrubland over a mixed herbland and mixed grassland. Some areas of Samphire.
7	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
9	Sand Dune	Scattered <i>Crotalaria cunninghamii</i> shrubs over a <i>*Cenchrus ciliaris</i> grassland.
10	Riverine	A low open <i>Eucalyptus</i> woodland over a mixed shrubland over a mixed herbland.
13	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.
15	Sand Plain	A low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia</i> hummock grassland.

Appendix B7 – Traps and Number of Replicates Used at Each Trap Site for Winter Survey

Site Number	# Cage Traps	# Elliott Traps	# Funnel Traps	# Bucket Traps	# Pot Traps	Total
2	10	10	20	10	20	70
3	10	10	20	10	20	70
4	10	10	20	10	20	70
5	10	10	20	10	20	70
6	10	10	20	10	20	70
7	10	10	20	10	20	70
9	10	10	20	10	20	70
10	10	10	20	10	20	70
13	10	10	20	10	20	70
15	10	10	20	10	20	70
TOTAL	100	100	200	100	200	700

Appendix B8 – Systematic Trapping Program for Winter Survey

Site Number	# nights Cage Traps	# nights Elliott Traps	# nights Funnel Traps	# nights Bucket Traps	# nights Pot Traps	Total nights
2	80	80	160	80	160	560
3	80	80	160	80	160	560
4	80	80	160	80	160	560
5	80	80	160	80	160	560
6	80	80	160	80	160	560
7	80	80	160	80	160	560
9	80	80	160	80	160	560
10	80	80	160	80	160	560
13	80	80	160	80	160	560

Site Number	# nights Cage Traps	# nights Elliott Traps	# nights Funnel Traps	# nights Bucket Traps	# nights Pot Traps	Total nights
15	80	80	160	80	160	560
TOTAL	800	800	1600	800	1600	5600

APPENDIX C

SITE PHOTOGRAPHS

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX C

SITE PHOTOGRAPHS

Site 2 – Roadside Verge



Site 3 – Sand Plain



Site 4 – Sand Plain



Site 5 – Sand Plain



Site 6 – Tidal Drainage Line



Site 7 – Sand Plain



Site 9 – Sand Dune



Site 10 – Riverine



Site 13 – Sand Plain



Site 15 – Sand Plain



APPENDIX D

ORNITHOLOGICAL CENSUS

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX D

ORNITHOLOGICAL CENSUS

D1 – Opportunistic Bird Searching Program for Summer Survey

Date	Location	Duration
28 October 2007	Finucane Island	8.5 h
29 October 2007	HBI plant	10 h
	Finucane Island	10 h
30 October 2007	East of Boodarie Landing	9 h
31 October 2007	East of Boodarie Landing	9.5 h
	Finucane Island	2 h
1 November 2007	HBI plant	4.5 h
2 November 2007	Riverine near Site 8	4 h
	Road verge near Site 1	2 h
	Plain near Site 2	2 h
3 November 2007	Riverine at Site 8	2 h
	Road verge along railway track	2 h
	Finucane Island	2 h
4 November 2007	Riverine near Site 8	5 h
Total		72.5 h

Appendix D2 – Opportunistic Bird Searching Program for Winter Survey

7

Date	Habitat Type	Duration
10 May 2008	Tidal Drainage Line	1 h
	Sand Plain	40 min
	Sand Plain	45 min
	Sand Plain	45 min
	Sand Dunes	50 min
	Riverine	30 min
	Billabong	50 min
11 May 2008	Riverine	45 min
	Roadside Verge	50 min
	Sand Plain	1 h
	Sand Plain	50 min
12 May 2008	Sand Dune	1 h
	Tidal Drainage Line	30 min
	Tidal Drainage Line	1 h
	Sand Dunes and Shoreline	2 h 30 min
13 May 2008	Sand Plain/Open Woodland	1 h
	Sand Plain	30 min
	Quarry	1 h
	Mangroves and mudflats	1 h
	Dunal	1h 30 min
	Minor Drainage	1h 30 min

Date	Habitat Type	Duration
	Water Hole	45 min
Total		21 h

APPENDIX E

ACOUSTIC BAT RECORDINGS

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX E

ACOUSTIC BAT RECORDINGS

Appendix E1 – AnaBat II Locations for Summer Survey

Date	GPS Coordinates	
	#Easting	#Northing
19 October 2007	661554	7745873
20 October 2007	657232	7744015
21 October 2007	665384	7744957
28 October 2007	661669	7743268
29 October 2007	659781	7743260
31 October 2007	662594	7753080
1 November 2007	671491	7731456
2 November 2007	667997	7731801
7 November 2007	662620	7741146
8 November 2007	671988	7729098

Australian Geocentric 1994 (GDA94), Zone 50K.

Appendix E2 – AnaBat II Recording Details for Summer Survey

Date	AnaBat II #	Duration	Habitat
19 October 2007	1	80 min	Site 5 – Adjacent to tidal creek.
20 October 2007	1	80 min	Under the bridge crossing the 'South West' River.
21 October 2007	1	80 min	Under the bridge crossing the 'South' River.
28 October 2007	1	80 min	Under the bridge crossing an ephemeral creek.

Date	AnaBat II #	Duration	Habitat
29 October 2007	1	80 min	Open eucalyptus woodland with no understorey.
31 October 2007	1	80 min	On causeway to Finucane Island.
1 November 2007	1	80 min	Roadside verge. <i>Triodia</i> with open <i>Acacia</i> shrubs.
2 November 2007	1	80 min	Site 8 – Riverine. <i>Eucalyptus</i> over <i>Triodia</i> .
7 November 2007	1	80 min	Bridge crossing ephemeral creek. Open <i>Eucalyptus</i> woodland over open <i>Triodia</i> .
8 November 2007	1	80 min	Quarry with standing water.

Appendix E3 – AnaBat II Locations for Winter Survey

Date	AnaBat II #	GPS Coordinates	
		#Easting	#Northing
11 May 2008	1	669171	7731747
11 May 2008	2	665330	7744940
12 May 2008	3	663432	7740184
14 May 2008	4	672037	7729112
14 May 2008	5	671008	7717595
15 May 2008	6	660903	7753831
15 May 2008	7	661628	7743250

Australian Geocentric 1994 (GDA94), Zone 50K.

Appendix E4 – AnaBat II Recording Details for Winter Survey

Date	AnaBat II #	Duration	Habitat
11 May 2008	1	610 min	Billabong
11 May 2008	2	610 min	Bridge
12 May 2008	3	610 min	Waterhole
14 May 2008	4	610 min	Quarry
14 May 2008	5	610 min	Mangroves
15 May 2008	6	610 min	Bridge
15 May 2008	7	610 min	Bridge

APPENDIX F

SITE-SPECIFIC CAPTURES

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX F

SITE SPECIFIC CAPTURES

Appendix F1 – Site-Specific Captures for Summer Survey

Quantum SKM **Site:** 2

Described by MW **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m

Season: Summer

Location: Port Hedland

MGA Zone: 50 671526 mE 7731265 mN

Habitat: Roadside Verge.

Soil

Rock Type

Vegetation: Open *Acacia* shrubland over a *Triodia* hummock grassland.

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Mammals								
Dasykaluta rosamondae					1			
Mus musculus	2	2		10				
Pseudomys hermannsburgensis				1				
Reptiles								
Carlia triacantha			1					
Ctenophorus isolepis isolepis	1							1
Ctenotus duricola	1							
Ctenotus helenae			1			2		
Ctenotus pantherinus	6	2				9		
Ctenotus saxatilis	3	1				20		
Diplodactylus conspicillatus	6					1		
Diporiphora winneckekei	2	1				1		
Heteronotia binoei			1					
Lialis burtonis						1		
Morethia ruficauda			1			1		
Proablepharus reginae	1							
Pseudonaja modesta						1		
Ramphotyphlops grypus			1					
Varanus acanthurus			2	4	2			
Varanus brevicauda	1							

Quantum SKM Site 3

Described by MW **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m

Season: Summer

Location: Port Hedland

MGA Zone: 50 664747 mE 7735183 mN

Habitat: Sand Plain.

Soil

Rock Type

Vegetation: Scattered mixed *Acacia* shrubs over a low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Mammals								
Notomys alexis					1			
Reptiles								
Ctenophorus isolepis isolepis			4		1			
Ctenotus duricola					1			
Ctenotus grandis	1				1			
Ctenotus helenae			1		1			
Ctenotus pantherinus	1		3		9			
Ctenotus saxatilis					1			
Diplodactylus conspicillatus	11		8		11			
Lucasium stenodactylum			2					
Diporiphora winneckeii					1			
Eremiascincus fasciolatus			1					
Gehyra variegata	2		1		2			
Lerista bipes	12		13		3			
Lialis burtonis	1							
Pogona minor					1			
Pseudechis australis					2			
Pygopus nigriceps					1			
Simoselaps anomalus					1			
Varanus acanthurus					1			
Varanus eremius	1				1			

Quantum SKM Site 4

Described by MW **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m

Season: Summer

Location: Port Hedland

MGA Zone: 50 661639 mE 7738270 mN

Habitat: Sand Plain.

Soil

Rock Type

Vegetation: A low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.

Vegetation Condition

Fire Age

Notes

Habitat: Logs: Leaves: Twigs: Rocks: Rocksheets: Litter: Bare:

Effort:

Species List:

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Mammals								
Mus musculus					5			
Notomys alexis					1			
Pseudomys hermannsburgensis					1			
Reptiles								
Ctenotus grandis							1	
Ctenotus pantherinus	1	1					2	
Ctenotus saxatilis							1	
Diplodactylus conspicillatus	2	2					2	
Lucasium stenodactylum	1							
Eremiascincus fasciolatus	1	2					3	
Gehyra variegata							1	
Lerista bipes	16	6					1	
Pogona minor subsp. mitchelli							1	
Ramphotyphlops grypus	1							
Varanus acanthurus	1							
Varanus eremius	1						2	

Quantum SKM Site 5

Described by MW **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m

Season: Summer

Location: Port Hedland

MGA Zone: 50 662788 mE 7739999 mN

Habitat: Sand plain.

Soil

Rock Type

Vegetation: A low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Mammals								
Pseudomys hermannsburgensis							1	
Reptiles								
Ctenophorus isolepis isolepis			2			1		
Ctenopus grandis			1					
Ctenopus pantherinus	1					3		
Diplodactylus conspicillatus	1		2					
Lucasium stenodactylum	2		4					
Eremiascincus fasciolatus			2					
Heteronotia binoei			1					
Lerista bipes	23	29				4		
Varanus eremius						1		
Varanus gouldii					1	1		

Quantum SKM Site 6**Described by** MW **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m**Season:** Summer**Location:** Port Hedland**MGA Zone:** 50 661418 mE 7745816 mN**Habitat:** Tidal Drainage Line.**Soil****Rock Type****Vegetation:** Low *Eucalyptus* woodland over an *Acacia tumida* shrubland over a mixed herbland and mixed grassland. Some areas of Samphire.**Vegetation Condition****Fire Age****Notes****Habitat:** **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:****Effort:****Species List:**

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Amphibia								
Notaden nichollsi	1							
Mammals								
Pseudomys hermannsburgensis				1				
Reptiles								
Carlia triacantha	1	1			1			
Ctenophorus isolepis isolepis	2	2			1			
Ctenophorus nuchalis					1			
Ctenotus duricola	1	2			3			
Ctenotus grandis		1						
Ctenotus pantherinus	2	2			2			
Ctenotus saxatilis	8	4			12			
Delma tineta					1			
Demansia psammophis		1						
Demansia rufescens					1			
Diplodactylus conspicillatus	4	4						
Lucasium stenodactylum	1							
Diporiphora winneckeii	1							
Gehyra variegata	1	2			6			
Heteronotia binoei		2						
Lerista bipes	17	31			7			
Menetia greyii	1							
Nephurus lewis pilbarensis		1						
Pogona minor subsp. minor	1							
Pseudechis australis					1			
Ramphotyphlops ammodytes	1							
Strophurus ciliaris aberrans	1				2			

Quantum SKM Site 7**Described by** MW **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m**Season:** Summer**Location:** Port Hedland**MGA Zone:** 50 656473 mE 7744246 mN**Habitat:** Sand Plain.**Soil****Rock Type****Vegetation:** A low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.**Vegetation Condition****Fire Age****Notes****Habitat:** **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:****Effort:****Species List:**

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Amphibia								
Notaden nichollsi		2						
Mammals								
Dasykaluta rosamondae				1	1			
Notomys alexis		1						
Pseudomys hermannsburgensis				1				
Sminthopsis youngsoni		1						
Reptiles								
Carlia triacantha	1	1			3			
Ctenophorus isolepis isolepis	2	1			1			
Ctenotus duricola	1	3						
Ctenotus grandis	2							
Ctenotus pantherinus	5	1			14			
Ctenotus saxatilis		1			1			
Ctenotus serventyi	1							
Demansia rufescens	1							
Diplodactylus conspicillatus					4			
Lerista bipes	2	13			2			
Menetia greyii		1						
Nephrurus levis pilbarensis		1			3			
Pogona minor		1						
Pseudechis australis					2			
Tiliqua multifasciata			1					
Varanus brevicauda	1	1						

Quantum SKM Site 9

Described by MB **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m

Season: Summer

Location: Finucane Island

MGA Zone: 50 662156 mE 7754542 mN

Habitat: Sand Dune.

Soil: Sandy.

Rock Type

Vegetation: Scattered *Crotalaria cunninghamii* shrubs over a **Cenchrus ciliaris* grassland. *Triodia* with sparse small shrubs.

Vegetation Condition

Fire Age

Notes

Habitat: Logs: 0 Leaves: 1 Twigs: 0 Rocks: 0 Rock sheet: 0 Litter: Bare: 50

Effort:

Species List:

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Mammals								
Pseudomys hermannsburgensis		1	1	38				
Zyzomys argurus		1						
Reptiles								
Ctenotus duricola		1						
Ctenotus saxatilis	4				8			
Ctenotus serventyi	1	1			2			
Eremiascincus fasciolatus	18	11			20			
Gehyra variegata	1							
Lerista bipes	23	63			7			
Lerista muelleri	6	5						
Menetia greyii	1				1			
Pseudechis australis					2			
Ramphotyphlops grypus	2							
Varanus gouldii			3		1			

Quantum SKM Site 10

Described by MW **Date:** 12/10/07-09/11/07 **Type:** Trap Site 30x100m

Season: Summer

Location: Port Hedland

MGA Zone: 50 666721 mE 7734911 mN

Habitat: Riverine.

Soil

Rock Type

Vegetation: A low open *Eucalyptus* woodland over a mixed shrubland over a mixed herbland.

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Name	Number of individuals by Observation Type							
	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Amphibia								
Cyclorana maini			1					
Notaden nichollsi	3		5					
Uperoleia russelli	1							
Mammals								
Mus musculus					7			
Notomys alexis					2			
Reptiles								
Amphibolurus longirostris						3		
Ctenophorus nuchalis			1					
Ctenotus saxatilis	7			1	30			
Delma butleri	1							
Diporiphora winneckeii	1							
Eremiascincus fasciolatus			7					
Gehyra variegata					1			
Lerista bipes	14	11			2			
Morethia ruficauda					3	3		
Morethia ruficauda subsp. exquisita			2					
Pseudechis australis					1			
Strophurus ciliaris aberrans	2	1			3			
Varanus acanthurus					1			

Appendix F2 – Site Specific Captures for Winter Survey

Quantum SKM

Site Bat Observations

Described by: MB

Date: 05/05/08-16/05/08

Type: Opportunistic

Season: Winter

Location: Port Hedland

MGA Zone

mE

mN

Habitat

Soil

Rock Type

Vegetation

Vegetation Condition

Fire Age

Notes: Data recorded using Anabat II bat recorders and analysed by Bob Bullen.

Habitat:

Logs:

Leaves:

Twigs:

Rocks:

Rock sheet:

Litter:

Bare:

Effort:

Species List:

Number of individuals by Observation Type

Name

Pit Pot Ca Ell Fu Net No Opp

Mammals

Chaerephon jobensis

Chalinolobus gouldii

Mormopterus beccarii

Mormopterus loriae subsp. cobourgiana

Nyctophilus geoffroyi

Saccolaimus flaviventris

Scotorepens greyii

Taphozous georgianus

Vespadelus finlaysoni

Quantum SKM **Site** Bird Observations
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Opportunistic
Season: Winter
Location: Port Hedland
MGA Zone mE mN
Habitat
Soil
Rock Type
Vegetation
Vegetation Condition
Fire Age
Notes: Avifauna observations and opportunistic observations made across the project area by Ornithologist.
Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Birds								
Aegotheles cristatus							1	
Anthus australis								2
Aquila audax								2
Aquila morphnoides								1
Ardea alba								1
Ardea garzetta								5
Ardea novaehollandiae								6
Ardea sacra								3
Artamus cinereus								16
Artamus superciliosus								15
Cacatua roseicapilla								24
Cacatua sanguinea								20
Certhionyx niger								2
Charadrius leschenaultii								3
Charadrius melanops								7
Coracina novaehollandiae								8
Corvus orru								7
Cuculus pallidus								3
Dromaius novaehollandiae								1
Elanus caeruleus								2
Emblema pictum								1
Eopsaltria pulverulenta								3
Eremiornis carteri								2
Eurostopodus argus								1
Falco berigora								2
Falco cenchroides								5
Geopelia cuneata								1
Geopelia striata								6
Geophaps plumifera								21
Grallina cyanoleuca								14
Haematopus fuliginosus								6
Haematopus longirostris								4
Haliaeetus leucogaster								3
Haliastur indus								7
Haliastur sphenurus								1
Hirundo ariel								6
Hirundo nigricans								21
Lalage tricolor								2
Larus novaehollandiae								12
Lichenostomus penicillatus								11
Lichenostomus virescens								33
Lichmera indistincta								8
Malurus lamberti								11
Malurus leucopterus								44
Manorina flavigula								10
Melopsittacus undulatus								73
Merops ornatus								17

Milvus migrans	4
Mirafra javanica	1
Nymphicus hollandicus	25
Ocyphaps lophotes	28
Pachycephala lanioides	4
Pelecanus conspicillatus	2
Phalacrocorax melanoleucos	8
Phalacrocorax varius	12
Rhipidura leucophrys	12
Rhipidura phasiana	2
Sterna (albifrons) sinensis	1
Sterna bengalensis	56
Sterna caspia	1
Sterna nilotica subsp. affinis	2
Tachybaptus novaehollandiae	3
Taeniopygia guttata	96
Todiramphus chloris	2
Todiramphus pyrrhopygia	2
Todiramphus sanctus	2
Threskiornis molucca	1
Zosterops luteus	24
Arenaria interpres	2
Tringa breviceps	3
Tringa cinerea	3
Tringa stagnatilis	3
Numenius phaeopus	3
Reptiles	
Egernia depressa	4

Quantum SKM **Site** Opportunistic Observations
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Opportunistic
Season: Winter
Location: Port Hedland
MGA Zone mE mN
Habitat
Soil
Rock Type
Vegetation
Vegetation Condition
Fire Age

Notes: Opportunistic observations made across the project area by survey team.

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Amphibia								
Cyclorana australis							11	2
Cyclorana maini							3	2
Limnodynastes spenceri							1	1
Litoria rubella							4	2
Notaden nicholli							4	
Birds								
Aegotheles cristatus								1
Ardeotis australis								3
Dromaius novaehollandiae								1
Eurostopodus argus								1
Falco berigora								1
Mammals								
Bos taurus								1
Canis lupus								1
Macropus robustus							2	7
Reptiles								
Amphibolurus longirostris								1
Aspidites melanocephalus								1
Aspidites ramsayi								1
Ctenophorus isolepis isolepis								1
Ctenophorus nuchalis								2
Gehyra punctata								1
Gehyra variegata							2	1
Tiliqua multifasciata								1
Varanus acanthurus								1

Quantum SKM **Site** 2
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Trap Site 30x100m

Season: Winter

Location: Port Hedland

MGA Zone: 50 671526 mE 7731265 mN

Habitat: Roadside verge

Soil

Rock Type

Vegetation: Open *Acacia* shrubland over a *Triodia* hummock grassland.

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Mammals								
Dasykaluta rosamondae				5	2			
Mus musculus				1				
Pseudomys hermannsburgensis				1				
Pseudomys nanus				1				
Reptiles								
Ctenophorus isolepis isolepis					1			1
Ctenotus helenae	1	1						
Ctenotus pantherinus	5	8			12			
Ctenotus saxatilis	7	4		2	16			1
Delma butleri					1			
Lucasium stenodactylum			1					
Diporiphora winneckeii	10	2						1
Eremiascincus fasciolatus					1			
Heteronotia binoei			3		3			
Morethia ruficauda			1					
Morethia ruficauda subsp. exquisita			1					
Pseudonaja modesta			1					
Varanus acanthurus					2			
Varanus gouldii								1

Quantum SKM Site 3**Described by:** MB**Date:** 05/05/08-16/05/08**Type:** Trap Site 30x100m**Season:** Winter**Location:** Port Hedland**MGA Zone:** 50 664747 mE 7735183 mN**Habitat:** Sand Plain.**Soil****Rock Type****Vegetation:** Scattered mixed *Acacia* shrubs over a low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.**Vegetation Condition****Fire Age****Notes****Habitat: Logs: Leaves: Twigs: Rocks: Rock sheet: Litter: Bare:****Effort:****Species List:**

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Mammals								
Notomys alexis	1			5				
Pseudomys hermannsburgensis				2	1			
Reptiles								
Ctenophorus isolepis isolepis	6	2	1		1			
Ctenotus duricola		2			1			
Ctenotus grandis		1						
Ctenotus grandis subsp. titan		1			3			
Ctenotus helenae		2			3			
Ctenotus pantherinus	6	9			25			
Ctenotus piankai	2	4						
Ctenotus saxatilis	1	5			4			
Demansia psammophis					1			
Diplodactylus conspicillatus	2	1			2			
Lucasium stenodactylum					1			
Diporiphora winneckei	1	1						
Gehyra variegata					1			
Lerista bipes	5	5			1			
Pogona minor subsp. minor	1							
Pogona minor subsp. mitchelli					1			2
Pseudonaja modesta		2			5			
Pseudonaja nuchalis					1			
Varanus eremius	1				1			

Quantum SKM **Site** 4
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Trap Site 30x100m
Season: Winter
Location: Port Hedland
MGA Zone: 50 661639 mE 7738270 mN
Habitat: Sand Plain.

Soil**Rock Type**

Vegetation: A low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.

Vegetation Condition**Fire Age****Notes**

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:**Species List:**

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Mammals								
Dasykaluta rosamondae					4			
Mus musculus	1				2	1		
Notomys alexis					1			
Pseudomys hermannsburgensis	1				4	1		
Reptiles								
Carlia triacantha			1			2		
Ctenophorus isolepis isolepis	1	2						2
Ctenotus grandis	1					1		
Ctenotus grandis subsp. titan						1		
Ctenotus helenae			1			1		
Ctenotus pantherinus	2	4				7		
Ctenotus rufescens			1					
Ctenotus saxatilis	4	3				2		
Ctenotus serventyi			2					
Diplodactylus conspicillatus	1							
Lucasium stenodactylum			1					
Diporiphora winneckeii	1							
Eremiascincus fasciolatus			2					
Lerista bipes	2	4		1				
Pogona minor subsp. minor	1							
Ramphotyphlops ammodytes	1							
Ramphotyphlops grypus	1							
Varanus acanthurus						2		
Varanus eremius	1	1				1		

Quantum SKM **Site** 5
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Trap Site 30x100m
Season: Winter
Location: Port Hedland
MGA Zone: 50 662788 mE 7739999 mN
Habitat: Sand Plain.

Soil**Rock Type**

Vegetation: A low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.

Vegetation Condition**Fire Age****Notes**

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:**Species List:**

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Amphibia								
Notaden nichollsi	1							
Mammals								
Dasykaluta rosamondae				2	3			
Notomys alexis				6				
Pseudomys desertor				1	1			
Pseudomys hermannsburgensis	1							
Pseudomys nanus				2				
Reptiles								
Carlia triacantha			2			1		
Ctenophorus isolepis isolepis	1							
Ctenotus grandis	1							
Ctenotus grandis subsp. titan			1					
Ctenotus pantherinus			3			1		
Ctenotus saxatilis	3		2			6		
Ctenotus serventyi						1		
Demansia psammophis						1		
Diplodactylus conspicillatus						1		
Diporiphora winneckeii	1							
Eremiascincus fasciolatus			2			1		
Lerista bipes	6		12			1		
Morethia ruficauda	1							
Pseudonaja nuchalis						1		
Varanus acanthurus						2		
Varanus bushi	1							
Varanus gouldii						1		

Quantum SKM Site 6**Described by:** MB**Date:** 05/05/08-16/05/08**Type:** Trap Site 30x100m**Season:** Winter**Location:** Port Hedland**MGA Zone:** 50 661418 mE 7745816 mN**Habitat:** Tidal Drainage Line.**Soil****Rock Type****Vegetation:** Low *Eucalyptus* woodland over an *Acacia tumida* shrubland over a mixed herbland and mixed grassland. Some areas of Samphire.**Vegetation Condition****Fire Age****Notes****Habitat: Logs: Leaves: Twigs: Rocks: Rock sheet: Litter: Bare:****Effort:****Species List:**

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Mammals								
Macropus robustus								2
Mus musculus				1				
Reptiles								
Carlia triacantha				1				
Ctenophorus isolepis isolepis	1	1						
Ctenotus duricola	1							
Ctenotus grandis	1							
Ctenotus helenae			1			1		
Ctenotus pantherinus						12		
Ctenotus rufescens			1			1		
Ctenotus saxatilis	3	7				2		
Ctenotus serventyi	1					1		
Delma butleri						1		
Diplodactylus conspicillatus			1			1		
Diporiphora winneckeii	1							
Lerista bipes	8	18		1	3			
Menetia greyii	1	2						
Nephrurus levis pilbarensis	2					1		
Strophurus ciliaris aberrans						1		
Varanus acanthurus						1		
Varanus eremius	1							

Quantum SKM **Site** 7
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Trap Site 30x100m
Season: Winter
Location: Port Hedland
MGA Zone: 50 656473 mE 7744246 mN
Habitat: Sand Plain.

Soil

Rock Type

Vegetation: A low open *Acacia stellaticeps* shrubland over a *Triodia* hummock grassland.

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Name	Number of individuals by Observation Type						
	Pit	Pot	Ca	Ell	Fu	Net	No Opp
Amphibia							
Notaden nicholli	4	10					
Mammals							
Dasykaluta rosamondae			1	7			
Mus musculus				1			
Pseudomys hermannsburgensis				3			
Pseudomys nanus				1			
Reptiles							
Carlia triacantha	1	1			2		
Ctenophorus isolepis isolepis	2						
Ctenotus duricola	2						
Ctenotus grandis					1		
Ctenotus grandis subsp. titan					2		
Ctenotus helenae					1		
Ctenotus pantherinus	1	6			9		
Ctenotus rufescens	1						
Ctenotus saxatilis	3				1		
Delma tincta	1						
Diplodactylus conspicillatus	2	2			4		
Lerista bipes	1	3			1		

Quantum SKM **Site** 9

Described by: MB

Date: 05/05/08-16/05/08

Type: Trap Site 30x100m

Season: Winter

Location: Finucane Island

MGA Zone: 50 662156 mE 7754542 mN

Habitat: Sand Dune

Soil: Sandy

Rock Type

Vegetation: Scattered *Crotalaria cunninghamii* shrubs over a **Cenchrus ciliaris* grassland. *Triodia* with sparse small shrubs

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** 0 **Leaves:** 1 **Twigs:** 0 **Rocks:** 0 **Rock sheet:** 0 **Litter:** **Bare:** 50

Effort:

Species List:

Name	Number of individuals by Observation Type						
	Pit	Pot	Ca	Ell	Fu	Net	No Opp
Mammals							
Mus musculus	1				9		
Pseudomys hermannsburgensis		1			3		
Reptiles							
Ctenotus saxatilis	3	4		1	24		
Ctenotus serventyi	2	11			4		
Delma butleri	1						
Eremiascincus fasciolatus	3	9			9		
Heteronotia binoei		1					
Lerista bipes	22	22			4		
Lerista muelleri	5	6			2		
Menetia greyii	1						
Pseudonaja modesta					1		
Ramphotyphlops grypus	2						

Quantum SKM **Site** 10
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Trap Site 30x100m

Season: Winter

Location: Port Hedland

MGA Zone 50 666721 **mE** 7734911 **mN**

Habitat: Riverine

Soil

Rock Type

Vegetation: A low open *Eucalyptus* woodland over a mixed shrubland over a mixed herbland.

Vegetation Condition

Fire Age

Notes

Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Name	Number of individuals by Observation Type						
	Pit	Pot	Ca	Ell	Fu	Net	No Opp
Amphibia							
Notaden nicholli	2	7					
Mammals							
Dasykaluta rosamondae				5			
Mus musculus				2			
Notomys alexis	1			2	1		
Pseudomys desertor				1			
Pseudomys hermannsburgensis				1			
Pseudomys nanus					1		
Reptiles							
Amphibolurus longirostris	1				4		
Ctenophorus isolepis isolepis	1	1					
Ctenotus pantherinus	2	2					
Ctenotus saxatilis	5	10			19		
Diporiphora winneckeii	2	1			1		
Eremiascincus fasciolatus	6	4			3		
Lerista bipes	3	12			2		
Morethia ruficauda		1					
Pogona minor		1					
Tiliqua multifasciata				1			
Varanus acanthurus		1			1		

Appendix F3 – Additional Site Specific Captures for the Winter Survey

Quantum SKM **Site** 13
Described by: MB **Date:** 05/05/08-16/05/08 **Type:** Trap Site 30x100m
Season: Winter
Location: Port Hedland
MGA Zone **mE** **mN**
Habitat
Soil
Rock Type
Vegetation
Vegetation Condition
Fire Age
Notes
Habitat: **Logs:** **Leaves:** **Twigs:** **Rocks:** **Rock sheet:** **Litter:** **Bare:**

Effort:

Species List:

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Mammals								
Dasykaluta rosamondae				5	2			
Pseudomys hermannsburgensis	1			7	2			
Sminthopsis youngsoni	1							
Reptiles								
Ctenophorus isolepis isolepis	3	2						1
Ctenotus duricola	2	2						
Ctenotus helenae	4	3			2			
Ctenotus pantherinus	4	9			8			1
Ctenotus piankai	1							
Ctenotus rufescens		1						
Ctenotus saxatilis	1	1			2			
Diplodactylus conspicillatus		1						
Lucasium stenodactylum	3							
Diporiphora winneckeii	5							
Morethia ruficauda	2	2						
Pogona minor					1			
Pseudechis australis					1			
Pseudonaja modesta			1		1			
Ramphotyphlops ammodytes					1			
Varanus acanthurus	1				1			
Varanus eremius	1				1			

Quantum SKM Site 15**Described by:** MB**Date:** 05/05/08-16/05/08**Type:** Trap Site 30x100m**Season:** Winter**Location:** Port Hedland**MGA Zone:** 50 656244 mE 7737652 mN**Habitat:** Acacia/Spinifex Plains.**Soil:** Sand**Rock Type****Vegetation:** Scattered Desert Oak over a thick *Acacia stellaticeps* under storey with a moderate cover of spinifex.**Vegetation Condition****Fire Age****Notes****Habitat:** **Logs:** **Leaves:** **Twigs:** 1 **Rocks:** **Rock sheet:** **Litter:** 5 **Bare:** 40**Effort:****Species List:**

Number of individuals by Observation Type

Name	Pit	Pot	Ca	Ell	Fu	Net	No	Opp
Mammals								
Dasykaluta rosamondae					2			
Notomys alexis					3			
Pseudomys hermannsburgensis					2			
Reptiles								
Ctenophorus isolepis isolepis	4		1					
Ctenotus duricola	1							
Ctenotus grandis	2					7		
Ctenotus grandis subsp. titan	1							
Ctenotus helenae	1		1					
Ctenotus pantherinus	1		2			3		
Ctenotus rufescens	1							
Ctenotus saxatilis			1				1	
Ctenotus serventyi	1		5				1	
Lucasium stenodactylum	1							
Lerista bipes	16		12				4	
Menetia greyii	1							
Pogona minor			1					
Simoselaps anomalus							1	
Varanus eremius	1		1				1	

APPENDIX G

**FAUNA SPECIES EXPECTED AND
OBSERVED IN THE
PROJECT AREA**

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX G

Fauna Species Expected and Observed in the Project Area and its Vicinity

Appendix G1 - Mammal Species Expected and Observed

Key:

Western Australian Museum Records:	A = Western Australian Museum Records;
Within 50km of Project Area	B= Hedland HBI Project – Boodarie Site- Flora, Vegetation and Vertebrate Fauna (Mattiske 1994); C= A Flora and Fauna Assessment of RGP5 Spoil Areas A and H, Port Hedland Harbour (Biota 2008);
Greater than 50km of Project Area	D = Hope Downs Environmental Review (Hope Downs 2002) E = FMG Stage A Rail Corridor (Biota 2004);
Current Project Area	F = Outer Harbour Development – Summer Survey (ENV); G = Outer Harbour Development – Winter Survey (ENV).

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Tachyglossidae (Echidnas)													
Echidna	<i>Tachyglossus aculeatus</i>				LC		x			x			
Dasyuridae (Carnivorous Marsupials)													
Brush-tailed Mulgara	<i>#Dasyercus cristicauda</i>	VU	S1		VU		x						
Brush-tailed Mulgara	<i>Dasyercus blythi</i>			P4			x						
Little Red Kaluta	<i>Dasykaluta rosamondae</i>				LC	√	x	x		x	x	x	
Northern Quoll	<i>Dasyurus hallucatus</i>	EN	S1		LC		x			x			
Wongai Ningai	<i>Ningai ridei</i>				LC					x			
Pilbara Ningai	<i>Ningai timealeyi</i>				LC	√	x			x	x		
Planigale	<i>Planigale sp.</i>						x			x			
Rory's Pseudantechinus	<i>Pseudantechinus roryi</i>						x			x			
Stripe-faced Dunnart	<i>Sminthopsis macroura</i>				LC		x	x		x	x		
Lesser Hairy-footed Dunnart	<i>Sminthopsis youngsoni</i>				LC		x			x	x	x	

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Macropodidae (Kangaroos)													
Spectacled Hare-wallaby	<i>Lagorchestes conspicillatus leichardti</i>			P3	LC		x						
Euro	<i>Macropus robustus</i>				LC		x	x	x		x	x	
Red Kangaroo	<i>Macropus rufus</i>				LC		x	x		x			
Pteropodidae (Fruit bats, Flying Foxes)													
Little Red Flying-fox	<i>Pteropus scapulatus</i>				LC		x				o		
Emballonuridae (Sheath-tail-bats)													
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>				LC		x				x	x	
Common Sheath-tail-bat	<i>Taphozous georgianus</i>				LC		x				x	x	
Hill's Sheath-tail-bat	<i>Taphozous hilli</i>				LC		x						
Megadermatidae (Ghost Bat)													
Ghost Bat	<i>Macroderma gigas</i>			P4	VU		x						
Hipposideridae (Leaf-nosed-bats)													
Pilbara Leaf-nosed Bat	<i>Rhinonicteris aurantia</i>	VU	S1		VU	√	x						
Vespertilionidae (Ordinary Bats)													
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>				LC		x				x	x	
Arnhem Long-eared Bat	<i>Nyctophilus arnhemensis</i>				LC						x		
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>				LC		x				x	x	
Little Broad-nosed Bat	<i>Scotorepens greyii</i>				LC		x				x	x	
Inland Forest Bat	<i>Vespadelus baverstocki</i>				LC								
Finlayson's Cave Bat	<i>Vespadelus finlaysoni</i>				LC		x				x	x	
Molossidae (Freetail-bats)													
Northern Freetail-bat	<i>Chaerephon jobensis</i>				LC		x				x	x	
Beccari's Freetail-bat	<i>Mormopterus beccarii</i>				LC							x	

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Little Northern Freetail-bat	<i>Mormopterus loriae cobourgensis</i>			P1			x				x	x	
Muridae (Rodents)													
Lakeland Downs Mouse	<i>Leggadina lakedownensis</i>			P4	LC		x		x	x			
House Mouse	* <i>Mus musculus</i>						x	x	x	x	x	x	
Spinifex-hopping Mouse	<i>Notomys alexis</i>				LC		x				x	x	
Western Pebble-mound Mouse	<i>Pseudomys chapmani</i>			P4	LC	√	x			x			
Delicate Mouse	<i>Pseudomys delicatulus</i>				LC		x		x				
Desert Mouse	<i>Pseudomys desertor</i>				LC		x		x	x		x	
Sandy Inland Mouse	<i>Pseudomys hermannsburgensis</i>				LC		x	x	x		x	x	
Western Chestnut Mouse	<i>Pseudomys nanus</i>				LC		x					x	
Common Rock-rat	<i>Zyomys argurus</i>				LC	√	x		x	x	x		
Leporidae													
European Rabbit	* <i>Oryctolagus cuniculus</i>						x				x		
Canidae (Dingo)													
Dingo	* <i>Canis lupus dingo</i>						x	x	x				
Wild Dog	* <i>Canis lupus familiaris</i>							x	x		x	x	
Fox	* <i>Vulpes vulpes</i>						x	x			x		
Felidae (Cats)													
Feral Cat	* <i>Felis catus</i>						x	x	x	x	x		
Equidae (Horses)													
Donkey	* <i>Equus asinus</i>						x						
Horse	* <i>Equus caballus</i>						x	x	x		x		
Camelidae													
Camel	* <i>Camelus dromedarius</i>						x		x				

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Bovidae (Cattle)													
European Cattle	<i>*Bos taurus</i>						X	X	X			X	X

Note: (o) denotes species recorded/observed outside the project area.
 (*) denotes introduced species.
 (#) denotes species name that is no longer current.



Appendix G2 - Reptile Species Expected and Observed

Key:

Western Australian Museum Records:

A = Western Australian Museum Records;

Within 50km of Project Area

B= Hedland HBI Project – Boodarie Site- Flora, Vegetation and Vertebrate Fauna (Mattiske 1994);
C= A Flora and Fauna Assessment of RGP5 Spoil Areas A and H, Port Hedland Harbour (Biota 2008);

Greater than 50km of Project Area

D = Hope Downs Environmental Review (Hope Downs 2002)
E = FMG Stage A Rail Corridor (Biota 2004);

Current Project Area

F = Outer Harbour Development – Summer Survey (ENV);
G = Outer Harbour Development – Winter Survey (ENV).

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Chelidae (Turtles)													
Plate-shelled Turtle	<i>Chelodina steindachneri</i>						x			x			
Agamidae (Dragons)													
Long-nosed Water Dragon	<i>Amphibolurus longirostris</i>						x	x	x	x		x	x
Gilberts Dragon	<i>Amphibolurus gilberti</i>												
Mulga Dragon	<i>Caimanops amphiboluroides</i>								x	x			
Ring-tailed Dragon	<i>Ctenophorus caudicinctus</i>						x			x	x		
Military Dragon	<i>Ctenophorus isolepis isolepis</i>						x	x		x	x	x	
Central Netted Dragon	<i>Ctenophorus nuchalis</i>						x			x		x	
Western Netted Dragon	<i>Ctenophorus reticulatus</i>						x			x			
	<i>Diporiphora valens</i>					√							
Common Two-lined Dragon	<i>Diporiphora winneckeii</i>						x					x	x
Bearded Dragon	<i>Pogona minor minor</i>											x	x
Bearded Dragon	<i>Pogona minor mitchelli</i>						x			x		x	x
Earless Pebble Dragon	<i>Tympanocryptis cephalus</i>						x						
Gekkonidae (Geckoes)													
Clawless Gecko	<i>Crenadactylus ocellatus</i>						x						

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Fat-tailed Gecko	<i>Diplodactylus conspicillatus</i>						x	x		x	x	x	x
Jewelled Gecko	<i>Diplodactylus mitchelli</i>					√	x			x			
	<i>Diplodactylus savagei</i>					√	x			x			
Pale-snouted Gecko	<i>Lucasium stenodactylum</i>						x	x		x	x	x	x
	<i>Lucasium wombeyi</i>					√	x			x	x		
Pilbara Dtella	<i>Gehyra pilbara</i>						x						
Spotted Dtella	<i>Gehyra punctata</i>						x			x		x	x
Purple Arid Dtella	<i>Gehyra purpurascens</i>						x						
Tree Dtella	<i>Gehyra variegata</i>						x	x		x	x	x	x
Bynoe's Gecko	<i>Heteronotia binoei</i>						x	x		x	x	x	x
Desert Cave Gecko	<i>Heteronotia spelea</i>					√	x			x			
Smooth Knob-tailed Gecko	<i>Nephurus levis pilbarensis</i>					√	x			x		x	x
Banded Knob-tailed Gecko	<i>Nephurus wheeleri cinctus</i>					√	x			x			
Marbled Velvet Gecko	<i>Oedura marmorata</i>						x			x			
Beaked Gecko	<i>Rhynchoedura ornata</i>						x	x		x			
Northern Spiny-tailed Gecko	<i>Strophurus ciliaris aberrans</i>						x			x		x	x
Jewelled Gecko	<i>Strophurus elderi</i>						x			x	x		
	<i>Strophurus jeanae</i>						x			x	x		
	<i>Strophurus wellingtonae</i>									x	x		
Pygopodidae (Legless Lizards)													
	<i>Delma borea</i>						x						
	<i>Delma butleri</i>						x	x					x
	<i>Delma elegans</i>					√	x			x			
	<i>Delma haroldi</i>						x			x			
	<i>Delma nasuta</i>						x			x	x		
	<i>Delma pax</i>						x	x		x	x		
	<i>Delma tincta</i>						x			x	x	x	x
Burtons snake-lizard	<i>Lialis burtonis</i>						x			x		x	

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Hooded Scaly-foot	<i>Pygopus nigriceps</i>						x	x		x		x	
Scincidae (Skinks)													
White-lipped Rainbow Skink	<i>Carlia munda</i>						x			x	x		
Desert Rainbow Skink	<i>Carlia triacantha</i>						x	x		x	x	x	x
Buchanan's snake-eyed Skink	<i>Cryptoblepharus buchani</i>												
Peron's snake-eyed Skink	<i>Cryptoblepharus plagioccephalus</i>												
Russet snake-eyed Skink	<i>Cryptoblepharus ustulatus</i>												
Spiny-palmed Shining Skink	# <i>Cryptoblepharus carnabyi</i>						x						
	# <i>Cryptoblepharus plagioccephalus</i>						x			x			
	<i>Ctenotus aff. robustus</i>									x			
	<i>Ctenotus aff. uber johnstonei</i>									x			
	<i>Ctenotus ariadnae</i>									x	x		
	<i>Ctenotus duricola</i>					√	x			x	x	x	x
	<i>Ctenotus grandis titan</i>					√	x	x		x	x	x	x
	<i>Ctenotus helenae</i>						x			x	x	x	x
Leopard Skink	<i>Ctenotus pantherinus ocellifer</i>						x	x		x	x	x	x
	<i>Ctenotus piankai</i>						x	x					x
	<i>Ctenotus robustus</i>						x						
	<i>Ctenotus rubicundus</i>					√	x			x			
	<i>Ctenotus rufescens</i>					√	x			x			x
Rock Ctenotus	<i>Ctenotus saxatilis</i>						x	x		x	x	x	x
	<i>Ctenotus serventyi</i>						x					x	x
Spinifex-slender Blue Tongue	<i>Cyclodomorphus melanops melanops</i>						x			x	x		
Pygmy Spiny-tailed Skink	<i>Egernia depressa</i>						x			x		x	x
Goldfields Crevice Skink	<i>Egernia formosa</i>						x						
	<i>Egernia pilbarensis</i>					√	x			x			
Nocturnal Desert Skink	<i>Egernia striata</i>						x						
Narrow-banded Sand	<i>Eremiascincus fasciolatus</i>						x					x	x

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Swimmer													
Broad-banded Sand Swimmer	<i>Eremiascincus richardsonii</i>						x			x			
	<i>Lerista aff. bipes</i>									x			
	<i>Lerista bipes</i>					√	x	x		x	x	x	
	<i>Lerista muelleri</i>					√	x			x	x	x	
Common Dwarf Skink	<i>Menetia greyii</i>						x	x		x	x	x	
	<i>Menetia surda</i>						x						
	<i>Morethia ruficauda exquisita</i>					√	x	x		x		x	
	<i>Notoscincus ornatus ornatus</i>						x	x		x			
	<i>Proablepharus reginae</i>						x			x			
Desert Bluetongue	<i>Tiliqua multifasciata</i>						x	x		x		x	
Varanidae (Monitors)													
Ridge-tailed Monitor	<i>Varanus acanthurus</i>						x	x		x		x	
	<i>Varanus aff. gilleni</i>									x			
Short-tailed Monitor	<i>Varanus brevicauda</i>						x			x		x	
Pilbara Goanna	<i>Varanus bushi</i>					√	x					x	
Pygmy Monitor	<i>Varanus caudolineatus</i>						x						
Desert Pygmy Monitor	<i>Varanus eremius</i>						x			x	x	x	
Perentie	<i>Varanus giganteus</i>						x			x		x	
Sand Monitor	<i>Varanus gouldii</i>						x	x		x	x	x	
Yellow-spotted Monitor	<i>Varanus panoptes rubidus</i>						x			x			
Pilbara Rock Monitor	<i>Varanus pilbarensis</i>					√	x						
Black-headed Monitor	<i>Varanus tristis tristis</i>						x			x			
Typhlopidae (Blind Snakes)													
	<i>Ramphotyphlops ammodytes</i>					√	x	x		x	x	x	
	<i>Ramphotyphlops ganei</i>				P1	√	x						
Beaked Blind Snake	<i>Ramphotyphlops grypus</i>						x			x	x	x	

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
	<i>Ramphotyphlops hamatus</i>						x						
Pilbara Blind Snake	<i>Ramphotyphlops pilbarensis</i>					√	x						
Boidae (Pythons)													
Pygmy Python	<i>Antaresia perthensis</i>						x		x		x		
Stimson's Python	<i>Antaresia stimsoni stimsoni</i>						x		x				
Black-headed Python	<i>Aspidites melanocephalus</i>						x		x			x	
Woma	<i>Aspidites ramsayi</i>		S4	P1	EN		x		x			x	
Elapidae (Front-fanged Snakes)													
Desert Death Adder	<i>Acanthophis pyrrhus</i>						x						
Pilbara Death Adder	<i>Acanthophis wellsii</i>					√	x		x		x		
Shovel-nosed Snake	<i>Brachyuropsis approximans</i>						x		x	x	x		
Yellow-faced Whip-Snake	<i>Demansia psammophis</i>						x		x	x	x	x	
Rufous Whip-Snake	<i>Demansia rufescens</i>					√	x				x		
Moon Snake	<i>Furina ornata</i>						x		x	x			
Mulga Snake	<i>Pseudechis australis</i>						x		x		x	x	
Ringed Snake	<i>Pseudonaja modesta</i>						x				x	x	
Gwardar	<i>Pseudonaja nuchalis</i>						x		x		x	x	
Desert Banded Snake	<i>Simoselaps anomalus</i>						x		x		x	x	
Rosen's Snake	<i>Suta fasciata</i>						x		x	x			
Spotted Snake	<i>Suta punctata</i>					√	x		x				
Pilbara Bandy Bandy Snake	<i>Vermicella snelli</i>					√	x		x				

Note: (o) denotes species recorded/observed outside the project area.
 [#] Taxon name is no longer current (Horner 2007).

Appendix G3 - Amphibian Species Expected and Observed

Key:

Western Australian Museum Records:	A = Western Australian Museum Records;
Within 50km of Project Area	B= Hedland HBI Project – Boodarie Site- Flora, Vegetation and Vertebrate Fauna (Mattiske 1994); C= A Flora and Fauna Assessment of RGP5 Spoil Areas A and H, Port Hedland Harbour (Biota 2008);
Greater than 50km of Project Area	D = Hope Downs Environmental Review (Hope Downs 2002) E = FMG Stage A Rail Corridor (Biota 2004);
Current Project Area	F = Outer Harbour Development – Summer Survey (ENV); G = Outer Harbour Development – Winter Survey (ENV).

COMMON NAME	SCIENTIFIC NAME	Conservation Codes					A	B	C	D	E	F	G
		EPBC	WC	DEC	IUCN	Local							
Hylidae (Tree Dwelling Frogs)													
Giant Frog	<i>Cyclorana australis</i>				LC		x			x			x
Mains Frog	<i>Cyclorana maini</i>				LC		x			x		x	x
Water Holding Frog	<i>Cyclorana platycephala</i>				LC		x						
Roth's Tree-Frog	<i>Litoria rothii</i>				LC							o	
Desert Tree-Frog	<i>Litoria rubella</i>				LC		x			x		x	x
Myobatrachidae (Ground Frogs)													
Spencers Frog	<i>Opisthodon spenceri</i>				LC		x			x			x
Northern Burrowing Frog	<i>Neobatrachus aquilonius</i>				LC		x						
Desert Spadefoot	<i>Notaden nicholli</i>				LC		x			x	x	x	x
Glandular Toadlet	<i>Uperoleia glandulosa</i>				LC	√	x						
Russell's Toadlet	<i>Uperoleia russelli</i>				LC		x			x	x	x	

Note: (o) denotes species recorded/observed outside the project area.

Appendix G4 - Bird Species Expected and Observed

Key:

Western Australian Museum Records:	A = Western Australian Museum Records;
Within 50km of Project Area	B= Hedland HBI Project – Boodarie Site- Flora, Vegetation and Vertebrate Fauna (Mattiske 1994); C= A Flora and Fauna Assessment of RGP5 Spoil Areas A and H, Port Hedland Harbour (Biota 2008);
Greater than 50km of Project Area	D = Hope Downs Environmental Review (Hope Downs 2002) E = FMG Stage A Rail Corridor (Biota 2004);
Current Project Area	F = Outer Harbour Development – Summer Survey (ENV); G = Outer Harbour Development – Winter Survey (ENV).

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Casuariidae (Cassowaries and Emus)														
Emu	<i>Dromaius novaehollandiae</i>	T				LC		x		x	x		x	
Phasianidae (Pheasants and Quails)														
Stubble Quail	<i>Coturnix pectoralis</i>	T				LC					x			
Brown Quail	<i>Coturnix ypsilophora</i>	T				LC						x		
Anatidae (Ducks, Geese and Swans)														
Pacific Black Duck	<i>Anas superciliosa</i>	FW				LC				x	x	o		
Grey Teal	<i>Anas gracilis</i>	FW				LC				x		o		
Hardhead	<i>Aythya australis</i>	FW				LC						o		
Australian Wood Duck	<i>Chenonetta jubata</i>	FW				LC				x				
Black Swan	<i>Cygnus atratus</i>	FW				LC						o		
Plumed Whistling-duck	<i>Dendrocygna eytoni</i>	FW				LC						o		
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	FW				LC						o		
Podicipedidae (Grebes)														
Australia Grebe	<i>Tachybaptus novaehollandiae</i>	FW				LC				x		x	x	
Anhingidae (Darters)														

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Darter	<i>Anhinga melanogaster</i>	FW				NT		x	x		x	x	o	
Phalacrocoracidae (Cormorants and Darters)														
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>	FW, Sh				LC				x			x	x
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	FW, Sh				LC				x				
Pied Cormorant	<i>Phalacrocorax varius</i>	FW, Sh				LC		x		x			x	x
Fregatidae														
Lesser Frigate Bird	<i>Fregata ariel</i>	S	Mi			LC							x	
Pelecanidae (Pelicans)														
Australian Pelican	<i>Pelecanus conspicillatus</i>	S, FW				LC				x			x	x
Ardeidae (Herons and Bitterns)														
Great Egret	<i>Ardea alba</i>	FW, Sh				LC							x	x
White-faced Heron	<i>Ardea novaehollandiae</i>	FW, Sh				LC		x		x	x		x	x
White-necked Heron	<i>Ardea pacifica</i>	FW				LC				x				
Striated Heron	<i>Butorides striatus</i>	M				LC				x			x	
Little Egret	<i>Egretta garzetta</i>	FW, Sh				LC			x	x			x	x
Eastern Reef Egret	<i>Egretta sacra</i>	Sh	Mi			LC				x			x	x
Nankeen Night Heron	<i>Nycticorax caledonicus</i>	FW, Sh				LC		x	x		x			
Threskiornithidae (Ibises and Spoonbills)														
Yellow-billed Spoonbill	<i>Platalea flavipes</i>	FW				LC		x						
Royal Spoonbill	<i>Platalea regia</i>	FW, Sh				LC								
Glossy Ibis	<i>Plegadis falcinellus</i>	FW, Sh	Mi			LC								
Australian White ibis	<i>Threskiornis molucca</i>	FW, Sh				LC			x	x			x	x
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	FW, Sh				LC		x		x				
Ciconiidae (Storks)														

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Jabiru	<i>Ephippiorhynchus asiaticus</i>	FW, Sh				NT				x	x			
Accipitridae (Kites, Hawks and Eagles)														
Collared Sparrowhawk	<i>Accipiter cirrocephalus</i>	T				LC					x			
Brown Goshawk	<i>Accipiter fasciatus</i>	T				LC				x	x			
Wedge-tailed Eagle	<i>Aquila audax</i>	T				LC				x	x	x	x	
Swamp Harrier	<i>Circus approximans</i>	FW				LC			x		x			
Spotted Harrier	<i>Circus assimilis</i>	T				LC		x		x	x	x		
Black-shouldered Kite	<i>Elanus caeruleus</i>	T				LC		x		x	x	x	x	
White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>	S	Mi			LC		x				x	x	
Brahminy Kite	<i>Haliastur indus</i>	S				LC		x	x	x		x	x	
Whistling Kite	<i>Haliastur sphenurus</i>	T, S				LC	x			x	x	x	x	
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	T				LC				x	x			
Little Eagle	<i>Hieraaetus morphnoides</i>	T				LC				x	x	x	x	
Square-tailed Kite	<i>Lophoictinia isura</i>	T				LC					x			
Black Kite	<i>Milvus migrans</i>	T				LC		x		x	x	x	x	
Osprey	<i>Pandion haliaetus</i>	S	Mi			LC		x				x		
Falconidae (Falcons)														
Australian Kestrel	<i>Falco cenchroides</i>	T				LC		x		x	x	x	x	
Brown Falcon	<i>Falco berigora</i>	T				LC		x		x	x	x	x	
Grey Falcon	<i>Falco hypoleucos</i>	T			P4	NT					x			
Australian Hobby	<i>Falco longipennis</i>	T				LC		x		x	x	x		
Black Falcon	<i>Falco subniger</i>	T				LC								
Peregrine Falcon	<i>Falco peregrinus</i>	T		S4		LC				x	x			
Rallidae (Waterhens)														
Buff-banded Rail	<i>Gallirallus philippensis</i>	T, FW, Sh				LC	x							
Spotted Crake	<i>Porzana fluminea</i>	T, FW, Sh				LC								

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Otididae (Bustards)														
Australian Bustard	<i>Ardeotis australis</i>	T			P4	NT		x		x	x	x	x	
Turnicidae (Button-quails)														
Little Button-quail	<i>Turnix velox</i>	T				LC		x		x	x	x		
Scolopacidae (Sandpipers and Snipes)														
Common Sandpiper	<i>Actitis hypoleucos</i>	Sh	Mi			LC				x		x		
Ruddy Turnstone	<i>Arenaria interpres</i>	Sh	Mi			LC						x	x	
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Sh	Mi			LC	x							
Red Knot	<i>Calidris canutus</i>	Sh	Mi			LC						x		
Curlew Sandpiper	<i>Calidris ferruginea</i>	Sh	Mi			LC						x		
Pectoral Sandpiper	<i>Calidris melanotos</i>	Sh	Mi			LC								
Red-necked Stint	<i>Calidris ruficollis</i>	Sh	Mi			LC						x		
Long-toed Stint	<i>Calidris subminuta</i>	Sh	Mi			LC								
Great Knot	<i>Calidris tenuirostris</i>	Sh	Mi			LC		x				x		
Snipe sp.	<i>Gallinago sp.</i>	FW						x						
Broad-billed Sandpiper	<i>Limicola falcinellus</i>	Sh	Mi			LC		x						
Bar-tailed Godwit	<i>Limosa lapponica</i>	Sh	Mi			LC						x		
Eastern Curlew	<i>Numenius madagascariensis</i>	Sh	Mi		P4	LC		x	x	x		x		
Whimbrel	<i>Numenius phaeopus</i>	Sh	Mi			LC		x	x	x		x	x	
Grey-tailed tattler	<i>Tringa brevipes</i>	Sh	Mi			LC				x		x	x	
Wood Sandpiper	<i>Tringa glareola</i>	FW, Sh	Mi			LC		x						
Common Greenshank	<i>Tringa nebularia</i>	Sh	Mi			LC			x			x		
Marsh Sandpiper	<i>Tringa stagnatilis</i>	FW, Sh	Mi			LC		x					x	
Terek Sandpiper	<i>Xenus cinereus</i>	Sh	Mi			LC			x			x	x	
Burhinidae (Stone-curlews)														
Bush Stone-curlew	<i>Burhinus grallarius</i>	T			P4	NT		x			x	x		

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Haematopodidae														
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	Sh				LC						x	x	
Pied Oystercatcher	<i>Haematopus longirostris</i>	Sh				LC				x		x	x	
Recurvirostridae (Stilts)														
Black-winged Stilt	<i>Himantopus himantopus</i>	FW, Sh				LC				x	x			
Banded Stilt	<i>Cladorhynchus leucocephalus</i>	FW, Sh				LC								
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	FW, Sh				LC	x							
Charadriidae (Plovers, Lapwings and Dotterels)														
Greater Sand Plover	<i>Charadrius leschenaultii</i>	Sh	Mi			LC		x				x	x	
Lesser Sand Plover	<i>Charadrius mongolus</i>	Sh	Mi			LC						x		
Red-capped Plover	<i>Charadrius ruficapillus</i>	Sh, T				LC				x		x		
Oriental Plover	<i>Charadrius veredus</i>	T, Sh	Mi			LC		x				x		
Black-fronted Dotterel	<i>Euseyonis melanops</i>	FW				LC				x	x		x	
Red-kneed Dotterel	<i>Erythrogonys cinctus</i>	FW				LC	x							
Pacific Golden Plover	<i>Pluvialis fulva</i>	Sh	Mi			LC								
Grey Plover	<i>Pluvialis squatarola</i>	Sh	Mi			LC						x		
Glareolidae (Pratincoles and Old-world Shore Birds)														
White-winged Black Tern	<i>Chlidonias leucoptera</i>	S	Ma			LC		x						
Oriental Pratincole	<i>Glareola maldivarum</i>	S	Mi			LC		x						
Laridae (Gulls and Terns)														
Silver Gull	<i>Larus novaehollandiae</i>	S				LC		x		x		x	x	
Little Tern	<i>Sterna albifrons</i>	S				LC			x			x	x	
Lesser Crested Tern	<i>Sterna bengalensis</i>	S				LC	x					x	x	
Crested Tern	<i>Sterna bergii</i>	S				LC	x			x		x		
Caspian Tern	<i>Sterna caspia</i>	S				LC	x			x		x	x	
Common Tern	<i>Sterna hirundo</i>	S	Mi			LC	x							

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Whiskered Tern	<i>Sterna hybrida</i>	S				LC		x					x	
Fairy Tern	<i>Sterna nereis</i>	S				LC							x	
Gull-billed Tern	<i>Sterna nilotica affinis</i>	S				LC			x		x		x	x
Columbidae (Pigeons and Doves)														
Diamond Dove	<i>Geopelia cuneata</i>	T				LC		x			x	x	x	x
Bar-shouldered Dove	<i>Geopelia humeralis</i>	M,T				LC					x			
Peaceful Dove	<i>Geopelia striata placida</i>	T				LC		x		x	x		x	x
Spinifex Pigeon	<i>Geophaps plumifera</i>	T				LC		x		x	x	x	x	x
Crested Pigeon	<i>Ocyphaps lophotes</i>	T				LC			x	x	x	x	x	x
Common Bronzewing	<i>Phaps chalcoptera</i>	T				LC			x		x			
Flock Bronzewing	<i>Phaps histrionica</i>	T			P4	LC		x						
Cacatuidae (Cockatoos)														
Galah	<i>Cacatua roseicapilla</i>	T				LC		x	x		x	x	x	x
Little Corella	<i>Cacatua sanguinea</i>	T				LC					x	x	x	x
Psittacidae (Lorikeets and Parrots)														
Australian Ringneck	<i>Barnardius zonarius</i>	T				LC		x	x		x			
Budgerigar	<i>Melopsittacus undulatus</i>	T				LC		x	x		x	x	x	x
Bourke's Parrot	<i>Neopsephotus bourkii</i>	T				LC		x						
Cockatiel	<i>Nymphicus hollandicus</i>	T				LC			x		x	x	x	x
Night Parrot	<i>Pezoporus occidentalis</i>	T	EN	S1		CR		x						
Mulga Parrot	<i>Psephotus varius</i>	T				LC					x			
Cuculidae (Cuckoos)														
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>	T				LC		x	x		x	x	x	
Black-eared Cuckoo	<i>Chrysococcyx osculans</i>	T				LC		x			x			
Pallid Cuckoo	<i>Cuculus pallidus</i>	T				LC		x			x	x		x

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Centropidae (Coucals)														
Pheasant Coucal	<i>Centropus phasianus</i>	T				LC		x			x		x	
Strigidae (Hawk-owls)														
Barking Owl	<i>Ninox connivens</i>	T				LC		x						
Southern Boobook Owl	<i>Ninox novaeseelandiae</i>	T				LC		x	x		x	x		
Tytonidae (Barn Owls)														
Barn Owl	<i>Tyto alba</i>	T				LC		x					x	
Podargidae (Frogmouths)														
Tawny Frogmouth	<i>Podargus strigoides</i>	T				LC		x			x	x	x	
Caprimulgidae (Nightjars)														
Spotted Nightjar	<i>Eurostopodus argus</i>	T				LC		x	x		x	x	x	
Aegothelidae (Owlet-nightjars)														
Australian Owlet-nightjar	<i>Aegotheles cristatus</i>	T				LC		x			x	x	x	
Apodidae (Swifts)														
Fork-tailed Swift	<i>Apus pacificus</i>	T, S	Mi			LC					x			
Halcyonidae (Kingfishers)														
Blue-winged Kookaburra	<i>Dacelo leachii</i>	T				LC		x			x	x		
Collared Kingfisher	<i>Todiramphus chloris</i>	M				LC			x				x	
Red-backed Kingfisher	<i>Todiramphus pyrrhopygia</i>	T				LC		x	x		x	x	x	
Sacred Kingfisher	<i>Todiramphus sanctus</i>	T				LC		x	x		x	x	x	
Meropidae (Bee-eaters)														
Rainbow Bee-eater	<i>Merops ornatus</i>	T	Mi			LC		x	x	x	x	x	x	

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Climacteridae (Treecreepers)														
Black-tailed Treecreeper	<i>Climacteris melanura</i>	T				LC		x						
Maluridae (Fairy-wrens)														
Striated Grasswren	<i>Amytornis striatus</i>	T				LC		x						
Variegated Fairy-wren	<i>Malurus lamberti</i>	T				LC		x	x		x	x	x	
White-winged Fairy-wren	<i>Malurus leucopterus</i>	T				LC		x	x	x	x	x	x	
Splendid Fairy-wren	<i>Malurus splendens</i>	T				LC								
Rufous-crowned Emu-wren	<i>Stipiturus ruficeps</i>	T				LC	√	x			x			
Pardalotidae (Pardalotes, Scrubwrens, Gerygones and Thornbills)														
Inland Thornbill	<i>Acanthiza apicalis</i>	T				LC					x			
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	T				LC								
Slaty-backed Thornbill	<i>Acanthiza robustirostris</i>	T				LC				x	x			
Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>	T				LC				x	x			
Western Gerygone	<i>Gerygone fusca mungi</i>	T				LC		x			x			
Mangrove Warbler	<i>Gerygone levigaster</i>	M				LC					x			
Dusky Gerygone	<i>Gerygone tenebrosa</i>	T				LC			x				x	
Red-browed Pardalote	<i>Pardalotus rubricatus</i>	T				LC		x	x		x	x		
Striated Pardalote	<i>Pardalotus striatus</i>	T				LC		x						
Redthroat	<i>Pyrrholaemus fuliginosus</i>	T				LC		x						
Weebill	<i>Smicrornis brevirostris</i>	T				LC		x		x	x	x		
Meliphagidae (Honeyeaters)														
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	T				LC		x			x	x		
Black Honeyeater	<i>Certhionyx niger</i>	T				LC					x	x	x	
Pied Honeyeater	<i>Certhionyx variegatus</i>	T				LC		x						
Grey Honeyeater	<i>Conopophila whitei</i>	T				LC	√	x						
Orange Chat	<i>Epthianura aurifrons</i>	T				LC								

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Crimson Chat	<i>Epthianura tricolor</i>	T				LC		x			x	x		
Grey-headed Honeyeater	<i>Lichenostomus keartlandi</i>	T				LC		x			x			
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	T				LC		x	x	x	x	x	x	x
Singing Honeyeater	<i>Lichenostomus virescens</i>	T				LC		x	x	x	x	x	x	x
Brown Honeyeater	<i>Lichmera indistincta</i>	T				LC		x	x	x	x	x	x	x
Yellow-throated Miner	<i>Manorina flavigula</i>	T				LC		x	x		x	x	x	x
Black-chinned Honeyeater	<i>Melithreptus gularis</i>	T				LC		x						
White-fronted Honeyeater	<i>Phylidonyris albifrons</i>	T				LC		x						
Petroicidae (Australian Robins)														
Mangrove Robin	<i>Eopsaltria pulverulenta</i>	M				LC			x		x		x	x
Hooded Robin	<i>Petroica cucullata</i>	T				LC		x			x	x		
Red-capped Robin	<i>Petroica goodenovii</i>	T				LC		x			x	x		
Pomatostomidae (Australian Babblers)														
White-browed Babbler	<i>Pomatostomus superciliosus</i>	T				LC					x	x		
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	T				LC		x			x			
Cinclosomatidae (Quail-thrushes)														
Chestnut-breasted Quail-thrush	<i>Cinclosoma castaneothorax</i>	T				LC						x		
Neosittidae (Sittellas)														
Varied Sittella	<i>Daphoenositta chrysoptera</i>	T				LC						x		
Pachycephalidae (Whistlers)														
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	T				LC		x			x			
Crested Bellbird	<i>Oreoica gutturalis</i>	T				LC					x	x		
White-breasted Whistler	<i>Pachycephala lanioides</i>	M				LC			x	x			x	x
Mangrove Golden Whistler	<i>Pachycephala melanura</i>	M				LC			x		x		x	
Rufous Whistler	<i>Pachycephala rufiventris</i>	T				LC		x	x		x	x		

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Dicruridae (Flycatchers)														
Magpie-Lark	<i>Grallina cyanoleuca</i>	T				LC		x	x	x	x	x	x	
Grey Fantail	<i>Rhipidura fuliginosa</i>	T				LC	x							
Willie Wagtail	<i>Rhipidura leucophrys</i>	T				LC	x	x	x	x	x	x	x	
Mangrove Grey Fantail	<i>Rhipidura phasiana</i>	M				LC	x	x		x		x	x	
Campephagidae (Cuckoo-shrikes)														
Ground Cuckoo-shrike	<i>Coracina maxima</i>	T				LC								
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	T				LC		x	x	x	x	x	x	
White-winged Triller	<i>Lalage tricolor</i>	T				LC	x			x	x	x	x	
Artamidae (Woodswallows)														
Black-faced Woodswallow	<i>Artamus cinereus</i>	T				LC	x	x		x		x	x	
White-breasted Woodswallow	<i>Artamus leucorhynchus</i>	T				LC	x	x	x		x	x		
Little Woodswallow	<i>Artamus minor</i>	T				LC				x				
Masked Woodswallow	<i>Artamus personatus</i>	T				LC				x	x			
White-browed Woodswallow	<i>Artamus superciliosus</i>	T				LC				x			x	
Pied Butcherbird	<i>Cracticus nigrogularis</i>	T				LC		x		x	x			
Australian Magpie	<i>Gymnorhina tibicen</i>	T				LC	x			x	x			
Grey Butcherbird	<i>Cracticus torquata</i>	T				LC				x	x			
Corvidae (Ravens and Crows)														
Little Crow	<i>Corvus bennetti</i>	T				LC		x		x				
Torresian Crow	<i>Corvus orru</i>	T				LC	x		x		x	x	x	
Western Crow	<i>Corvus orru ceciliae</i>	T				LC				x				
Ptilonorhynchidae (Bowerbirds)														
Western Bowerbird	<i>Chlamydera guttata</i>	T				LC	x			x				

COMMON NAME	SCIENTIFIC NAME	Broad Habitat Specialisation	Conservation Codes					A	B	C	D	E	F	G
			EPBC	WC	DEC	IUCN	Local							
Hirundinidae (Swallows)														
Fairy Martin	<i>Hirundo ariel</i>	T				LC		x	x		x	x	x	x
Tree Martin	<i>Hirundo nigricans</i>	T				LC			x		x		x	x
Zosteropidae (White-eyes)														
Yellow White-eye	<i>Zosterops luteus</i>	M				LC			x		x		x	x
Sylviidae (Old World Warblers)														
Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	FW				LC					x			
Brown Songlark	<i>Cincloramphus cruralis</i>	T				LC			x		x	x	x	
Rufous Songlark	<i>Cincloramphus mathewsi</i>	T				LC		x			x	x	x	
Spinifex Bird	<i>Eremiornis carteri</i>	T				LC		x			x	x	x	x
Alaudidae (Songlarks)														
Singing Bushlark	<i>Mirafra javanica</i>	T				LC		x	x		x	x	x	x
Dicaeidae (Flower-peckers)														
Mistletoebird	<i>Dicaeum hirundinaceum</i>	T				LC		x				x		
Passeridae (Finches and Allies)														
Painted Finch	<i>Emblema pictum</i>	T				LC		x			x	x		x
Star Finch	<i>Neochmia ruficauda clarescens</i>	T			P4	NT								
Zebra Finch	<i>Taeniopygia guttata</i>	T				LC		x	x	x	x	x	x	x
Motacillidae (Pipits and True Wagtails)														
Australian Pipit	<i>Anthus novaeseelandiae</i>	T				LC			x	x	x	x	x	x

Note: (o) denotes species recorded/observed outside the project area.

Broad Habitat Specification lists the time of habitat in the project area that the bird species requires for them to be present: (M) = Mangrove Specialist, (Sh) = Shorebird, (S) = Seabird, (Fw) = Freshwater Waterbird, (T) = Terrestrial Bird.

APPENDIX H

MAMMAL INVENTORY

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX H

MAMMAL INVENTORY

Appendix H1 - Complete Mammal Species Inventory for Survey

Family	Scientific Name	Common Name
DASYURIDAE	<i>Dasykaluta rosamondae</i>	Little Red Kaluta
	<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart
MACROPODIDAE	<i>Macropus robustus</i>	Euro
PTEROPODIDAE	<i>Pteropus scapulatus</i>	Little Red Flying-fox
EMBALLONURIDAE	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat
	<i>Taphozous georgianus</i>	Common Sheathtail-bat
VESPERTILIONIDAE	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
	<i>Scotorepens greyii</i>	Little Broad-nosed Bat
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat
	<i>Nyctophilus arnhemensis</i>	Arnhem Long-eared Bat
MOLOSSIDAE	<i>Chaerephon jobensis</i>	Northern Freetail-bat
	<i>Mormopterus beccarii</i>	Beccari's Freetail-bat
	<i>Mormopterus loriae cobourgensis</i>	Little Northern Freetail Bat
MURIDAE	<i>Mus musculus</i>	House Mouse
	<i>Notomys alexis</i>	Spinifex-hopping Mouse
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse
	<i>Pseudomys nanus</i>	Western Chestnut Mouse
	<i>Zyomys argurus</i>	Common Rock-rat
LEPORIDAE	<i>Oryctolagus cuniculus</i>	Rabbit
CANIDAE	<i>Canis lupus familiaris</i>	Wild Dog
	<i>Vulpes vulpes</i>	Fox
FELIDAE	<i>Felis catus</i>	Feral Cat

Family	Scientific Name	Common Name
EQUIDAE	<i>Equus caballus</i>	Horse
BOVIDAE	<i>Bos taurus</i>	Cattle

Appendix H2 - Mammal Species Inventory for Summer Survey

Family	Scientific Name	Common Name
DASYURIDAE	<i>Dasykaluta rosamondae</i>	Little Red Kaluta
	<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart
MACROPODIDAE	<i>Macropus robustus</i>	Euro
PTEROPODIDAE	<i>Pteropus scapulatus</i>	Little Red Flying-fox
EMBALLONURIDAE	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat
	<i>Taphozous georgianus</i>	Common Sheathtail-bat
VESPERTILIONIDAE	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
	<i>Scotorepens greyii</i>	Little Broad-nosed Bat
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat
	<i>Nyctophilus arnhemensis</i>	Arnhem Long-eared Bat
MOLOSSIDAE	<i>Chaerephon jobensis</i>	Northern Freetail-bat
	<i>Mormopterus loriae cobourgensis</i>	Little Northern Freetail Bat
MURIDAE	<i>Mus musculus</i>	House Mouse
	<i>Notomys alexis</i>	Spinifex-hopping Mouse
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse
	<i>Zyzomys argurus</i>	Common Rock-rat
LEPORIDAE	<i>Oryctolagus cuniculus</i>	Rabbit
CANIDAE	<i>Canis lupus familiaris</i>	Wild Dog
	<i>Vulpes vulpes</i>	Fox
FELIDAE	<i>Felis catus</i>	Feral Cat
EQUIDAE	<i>Equus caballus</i>	Horse
BOVIDAE	<i>Bos taurus</i>	Cattle

Appendix H3 - Mammal Species Inventory for Winter Survey

Family	Scientific Name	Common Name
DASYURIDAE	<i>Dasykaluta rosamondae</i>	Little Red Kaluta
	<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart
MACROPODIDAE	<i>Macropus robustus</i>	Euro
VESPRTLIONIDAE	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat
	<i>Scotorepens greyii</i>	Little Broad-nosed Bat
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat
MOLOSSIDAE	<i>Chaerephon jobensis</i>	Northern Freetail-bat
	<i>Mormopterus beccarii</i>	Beccari's Freetail-bat
	<i>Mormopterus loriae cobourgensis</i>	Little Northern Freetail-bat
MURIDAE	<i>Mus musculus</i>	House Mouse
	<i>Notomys alexis</i>	Spinifex-hopping Mouse
	<i>Pseudomys desertor</i>	Desert Mouse
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse
	<i>Pseudomys nanus</i>	Western Chestnut Mouse
CANIDAE	<i>Canis lupus familiaris</i>	Wild Dog
BOVIDAE	<i>Bos taurus</i>	Cattle

Appendix H4 - Mammal Species Inventory for Additional Areas

Family	Scientific Name	Common Name
DASYURIDAE	<i>Dasykaluta rosamondae</i>	Little Red Kaluta
	<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart
MURIDAE	<i>Notomys alexis</i>	Spinifex-hopping Mouse
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse

APPENDIX I

REPTILE INVENTORY

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX I

REPTILE INVENTORY

Appendix I1 - Complete Reptile Species Inventory for Survey

Family	Scientific Name	Common Name
AGAMIDAE	<i>Amphibolurus longirostris</i>	Long-nosed Water Dragon
	<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon
	<i>Ctenophorus isolepis isolepis</i>	Military Sand Dragon
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon
	<i>Diporiphora winneckeii</i>	Common Two-lined Dragon
	<i>Pogona minor minor</i>	Bearded Dragon
	<i>Pogona minor mitchelli</i>	Bearded Dragon
GEKKONIDAE	<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko
	<i>Gehyra punctata</i>	Spotted Dtella
	<i>Gehyra variegata</i>	Tree Dtella
	<i>Heteronotia binoei</i>	Bynoe's Gecko
	<i>Lucasium stenodactylum</i>	Pale-snouted Ground Gecko
	<i>Nephrurus levis pilbarensis</i>	Common Knob-tailed Gecko
	<i>Strophurus ciliaris aberrans</i>	Northern Spiny-tailed Gecko
PYGOPODIDAE	<i>Delma butleri</i>	Unbanded Delma
	<i>Delma tinctoria</i>	
SCINCIDAE	<i>Carlia triacantha</i>	Desert Rainbow Skink
	<i>Ctenotus duricola</i>	
	<i>Ctenotus grandis titan</i>	
	<i>Ctenotus helenae</i>	
	<i>Ctenotus pantherinus ocellifer</i>	Leopard Ctenotus

Family	Scientific Name	Common Name
	<i>Ctenotus piankai</i>	
	<i>Ctenotus rufescens</i>	
	<i>Ctenotus saxatilis</i>	Rock Ctenotus
	<i>Ctenotus serventyi</i>	
	<i>Egernia depressor</i>	Pygmy Spiny-tailed Skink
	<i>Eremiascincus fasciolatus</i>	Narrow-banded Sand Swimmer
	<i>Lerista bipes</i>	
	<i>Lerista muelleri</i>	
	<i>Menetia greyii</i>	Common Dwarf Skink
	<i>Morethia ruficauda exquisita</i>	Fire-tailed Skink
	<i>Tiliqua multifasciata</i>	
VARANIDAE	<i>Varanus acanthurus</i>	Ridge-tailed Monitor
	<i>Varanus brevicauda</i>	Short-tailed Monitor
	<i>Varanus bushi</i>	Bush's Pygmy Monitor
	<i>Varanus eremius</i>	Desert Pygmy Monitor
	<i>Varanus giganteus</i>	Perentie
	<i>Varanus gouldii</i>	Sand Monitor
TYPHLOPIDAE	<i>Ramphotyphlops ammodytes</i>	
	<i>Ramphotyphlops grypus</i>	Beaked Blind Snake
BOIDAE	<i>Aspidites melanocephalus</i>	Black Headed Python
	<i>Aspidites ramsayi</i>	Woma
ELAPIDAE	<i>Acanthophis wellsi</i>	Pilbara Death Adder
	<i>Brachyuropis approximans</i>	Shovel-nosed Snake
	<i>Demansia psammophis</i>	Yellow-faced Whip-Snake
	<i>Demansia rufescens</i>	Rufous Whip-Snake

Family	Scientific Name	Common Name
	<i>Pseudechis australis</i>	Mulga Snake
	<i>Pseudonaja modesta</i>	Ringed Snake
	<i>Pseudonaja nuchalis</i>	Gwardar
	<i>Simoselaps anomalus</i>	Desert Banded Snake

Appendix I2 - Reptile Species Inventory for Summer Survey

Family	Scientific Name	Common Name
AGAMIDAE	<i>Amphibolurus longirostris</i>	Long-nosed Water Dragon
	<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon
	<i>Ctenophorus isolepis isolepis</i>	Military Dragon
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon
	<i>Diporiphora winneckeii</i>	Common Two-lined Dragon
	<i>Pogona minor mitchelli</i>	Bearded Dragon
GEKKONIDAE	<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko
	<i>Lucasium stenodactylum</i>	Pale-snouted Gecko
	<i>Gehyra punctata</i>	Spotted Dtella
	<i>Gehyra variegata</i>	Tree Dtella
	<i>Heteronotia binoei</i>	Bynoe's Gecko
	<i>Nephrurus levis pilbarensis</i>	Smooth Knob-tailed Gecko
	<i>Strophurus cillaris abberans</i>	Northern Spiny-tailed Gecko
PYGOPODIDAE	<i>Delma tinctoria</i>	
SCINCIDAE	<i>Carlia triacantha</i>	Desert Rainbow Skink
	<i>Ctenotus duricola</i>	
	<i>Ctenotus grandis titan</i>	
	<i>Ctenotus helenae</i>	
	<i>Ctenotus pantherinus ocellifer</i>	

Family	Scientific Name	Common Name
	<i>Ctenotus saxatilis</i>	Rock Ctenotus
	<i>Ctenotus serventyi</i>	
	<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink
	<i>Eremiascincus fasciolatus</i>	Narrow-banded Sand Swimmer
	<i>Lerista bipes</i>	
	<i>Lerista muelleri</i>	
	<i>Menetia greyii</i>	Common Dwarf Skink
	<i>Morethia ruficauda exquisita</i>	
	<i>Tiliqua multifasciata</i>	
VARANIDAE	<i>Varanus acanthurus</i>	Ridge-tailed Monitor
	<i>Varanus brevicauda</i>	Short-tailed Monitor
	<i>Varanus eremius</i>	Desert Pygmy Monitor
	<i>Varanus giganteus</i>	Perentie
	<i>Varanus gouldii</i>	Sand Monitor
TYPHLOPIDAE	<i>Ramphotyphlops ammodytes</i>	
	<i>Ramphotyphlops grypus</i>	Beaked Blind Snake
ELAPIDAE	<i>Acanthophis wellsi</i>	Pilbara Death Adder
	<i>Brachyuropis approximans</i>	Shovel-nosed Snake
	<i>Demansia psammophis</i>	Yellow-faced Whip-Snake
	<i>Demansia rufescens</i>	Rufous Whip-Snake
	<i>Pseudechis australis</i>	Mulga Snake
	<i>Pseudonaja modesta</i>	Ringed Snake
	<i>Pseudonaja nuchalis</i>	Gwardar
	<i>Simoselaps anomalus</i>	Desert Banded Snake

Appendix I3 - Reptile Species Inventory for Winter Survey

Family	Scientific Name	Common Name
AGAMIDAE	<i>Amphibolurus longirostris</i>	Long-nosed Water Dragon
	<i>Ctenophorus isolepis isolepis</i>	Military Sand Dragon
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon
	<i>Diporiphora winneckeii</i>	Common Two-lined Dragon
	<i>Pogona minor minor</i>	Bearded Dragon
	<i>Pogona minor mitchelli</i>	Bearded Dragon
GEKKONIDAE	<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko
	<i>Gehyra punctata</i>	Spotted Dtella
	<i>Gehyra variegata</i>	Tree Dtella
	<i>Heteronotia binoei</i>	Bynoe's Gecko
	<i>Lucasium stenodactylum</i>	Pale-snouted Ground Gecko
	<i>Nephrurus levis pilbarensis</i>	Common Knob-tailed Gecko
	<i>Strophurus ciliaris aberrans</i>	Northern Spiny-tailed Gecko
PYGOPODIDAE	<i>Delma butleri</i>	Unbanded Delma
	<i>Delma tinctoria</i>	
SCINCIDAE	<i>Carlia triacantha</i>	Desert Rainbow Skink
	<i>Ctenotus duricola</i>	
	<i>Ctenotus grandis titan</i>	
	<i>Ctenotus helenae</i>	
	<i>Ctenotus pantherinus ocellifer</i>	Leopard Ctenotus
	<i>Ctenotus piankai</i>	
	<i>Ctenotus rufescens</i>	
	<i>Ctenotus saxatilis</i>	Rock Ctenotus
	<i>Ctenotus serventyi</i>	

Family	Scientific Name	Common Name
	<i>Egernia depressor</i>	Pygmy Spiny-tailed Skink
	<i>Eremiascincus fasciolatus</i>	Narrow-banded Sand Swimmer
	<i>Lerista bipes</i>	
	<i>Lerista muelleri</i>	
	<i>Menetia greyii</i>	Common Dwarf Skink
	<i>Morethia ruficauda exquisita</i>	Fire-tailed Skink
	<i>Tiliqua multifasciata</i>	
VARANIDAE	<i>Varanus acanthurus</i>	Ridge-tailed Monitor
	<i>Varanus bushi</i>	Bush's Pygmy Monitor
	<i>Varanus eremius</i>	Desert Pygmy Monitor
	<i>Varanus gouldii</i>	Sand Monitor
TYPHLOPIDAE	<i>Ramphotyphlops ammodytes</i>	
	<i>Ramphotyphlops grypus</i>	Beaked Blind Snake
BOIDAE	<i>Aspidites melanocephalus</i>	Black Headed Python
	<i>Aspidites ramsayi</i>	Woma
ELAPIDAE	<i>Demansia psammophis</i>	Yellow-faced Whip-Snake
	<i>Pseudechis australis</i>	Mulga Snake
	<i>Pseudonaja modesta</i>	Ringed Snake
	<i>Pseudonaja nuchalis</i>	Gwardar
	<i>Simoselaps anomalus</i>	Desert Banded Snake

Appendix I4 - Reptile Species Inventory for Additional Areas

Family	Scientific Name	Common Name
AGAMIDAE	<i>Ctenophorus isolepis isolepis</i>	Military Sand Dragon
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon

Family	Scientific Name	Common Name
	<i>Diporiphora winneckeii</i>	Common Two-lined Dragon
	<i>Pogona minor minor</i>	Bearded Dragon
GEKKONIDAE	<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko
	<i>Lucasium stenodactylum</i>	Pale-snouted Ground Gecko
SCINCIDAE	<i>Ctenotus duricola</i>	
	<i>Ctenotus grandis titan</i>	
	<i>Ctenotus helenae</i>	
	<i>Ctenotus pantherinus ocellifer</i>	Leopard Ctenotus
	<i>Ctenotus piankai</i>	
	<i>Ctenotus rufescens</i>	
	<i>Ctenotus saxatilis</i>	Rock Ctenotus
	<i>Ctenotus serventyi</i>	
	<i>Lerista bipes</i>	
	<i>Menetia greyii</i>	Common Dwarf Skink
	<i>Morethia ruficauda exquisita</i>	Fire-tailed Skink
VARANIDAE	<i>Varanus acanthurus</i>	Ridge-tailed Monitor
	<i>Varanus eremius</i>	Desert Pygmy Monitor
TYPHLOPIDAE	<i>Ramphotyphlops ammodytes</i>	
BOIDAE	<i>Aspidites ramsayi</i>	Woma
ELAPIDAE	<i>Pseudechis australis</i>	Mulga Snake
	<i>Pseudonaja modesta</i>	Ringed Snake
	<i>Simoselaps anomalus</i>	Desert Banded Snake

APPENDIX J

AMPHIBIAN INVENTORY

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX J

AMPHIBIAN INVENTORY

Appendix J1 - Complete Amphibian Species Inventory for Survey

Family	Scientific Name	Common Name
HYLIDAE	<i>Cyclorana australis</i>	Giant Frog
	<i>Cyclorana maini</i>	Main's Frog
	<i>Litoria rothii</i>	Roth's Tree-frog
	<i>Litoria rubella</i>	Desert Tree-frog
MYOBATRACHIDAE	<i>Limnodynastes spenceri</i>	Spencer's Frog
	<i>Notaden nichollsi</i>	Desert Spadefoot
	<i>Uperoleia russelli</i>	Russell's Toadlet

Appendix J2 - Amphibian Species Inventory for Summer Survey

Family	Scientific Name	Common Name
HYLIDAE	<i>Cyclorana maini</i>	Main's Frog
	<i>Litoria rothii</i>	Roth's Tree-frog
	<i>Litoria rubella</i>	Desert Tree-frog
MYOBATRACHIDAE	<i>Notaden nichollsi</i>	Desert Spadefoot
	<i>Uperoleia russelli</i>	Russell's Toadlet

Appendix J3 - Amphibian Species Inventory for Winter Survey

Family	Scientific Name	Common Name
HYLIDAE	<i>Cyclorana australis</i>	Giant Frog
	<i>Cyclorana maini</i>	Main's Frog
	<i>Litoria rubella</i>	Desert Tree-frog
MYOBATRACHIDAE	<i>Limnodynastes spenceri</i>	Spencer's Frog
	<i>Notaden nichollsi</i>	Desert Spadefoot

APPENDIX K

BIRD INVENTORY

OUTER HARBOUR DEVELOPMENT FAUNA ASSESSMENT

APPENDIX K

Appendix K1 - Complete Bird Species Inventory for Survey

Family	Scientific Name	Common Name
CASUARIIDAE	<i>Dromaius novaehollandiae</i>	Emu
PHASIANIDAE	<i>Coturnix ypsilophora</i>	Brown Quail
ANATIDAE	<i>Anas superciliosa</i>	Pacific Black Duck
	<i>Anas gracilis</i>	Grey Teal
	<i>Aythya australis</i>	Hardhead
	<i>Cygnus atratus</i>	Black Swan
	<i>Dendrocygna eytoni</i>	Plumed Whistling-duck
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck
PODICIPEDIDAE	<i>Tachybaptus novaehollandiae</i>	Australia Grebe
ANHINGIDAE	<i>Anhinga melanogaster</i>	Darter
PHALACROCORACIDAE	<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant
	<i>Phalacrocorax varius</i>	Pied Cormorant
FREGATIDAE	<i>Fregata ariel</i>	Lesser Frigate Bird
PELECANIDAE	<i>Pelecanus conspicillatus</i>	Australian Pelican
ARDEIDAE	<i>Ardea novaehollandiae</i>	White-faced Heron
	<i>Ardea alba</i>	Great Egret
	<i>Butorides striatus</i>	Striated Heron
	<i>Egretta garzetta</i>	Little Egret
	<i>Egretta sacra</i>	Eastern Reef Egret
THRESKIORNITHIDAE	<i>Threskiornis molucca</i>	Australian White ibis
ACCIPITRIDAE	<i>Elanus caeruleus</i>	Black-shouldered Kite
	<i>Milvus migrans</i>	Black Kite

Family	Scientific Name	Common Name
	<i>Haliastur indus</i>	Brahminy Kite
	<i>Haliastur sphenurus</i>	Whistling Kite
	<i>Circus assimilis</i>	Spotted Harrier
	<i>Aquila audax</i>	Wedge-tailed Eagle
	<i>Haliaeetus leucogaster</i>	White-breasted Sea Eagle
	<i>Hieraaetus morphnoides</i>	Little Eagle
	<i>Pandion haliaetus</i>	Osprey
FALCONIDAE	<i>Falco cenchroides</i>	Australian Kestrel
	<i>Falco berigora</i>	Brown Falcon
	<i>Falco longipennis</i>	Australian Hobby
OTIDAE	<i>Ardeotis australis</i>	Australian Bustard
TURNICIDAE	<i>Turnix velox</i>	Little Button-quail
SCOLOPACIDAE	<i>Arenaria interpres</i>	Ruddy Turnstone
	<i>Calidris canutus</i>	Red Knot
	<i>Calidris ferruginea</i>	Curlew Sandpiper
	<i>Calidris ruficollis</i>	Red-necked Stint
	<i>Calidris tenuirostris</i>	Great Knot
	<i>Actitis hypoleucos</i>	Common Sandpiper
	<i>Xenus cinereus</i>	Terek Sandpiper
	<i>Tringa nebularia</i>	Common Greenshank
	<i>Tringa stagnatilis</i>	Marsh Sandpiper
	<i>Limosa lapponica</i>	Bar-tailed Godwit
	<i>Numenius madagascariensis</i>	Eastern Curlew
	<i>Numenius phaeopus</i>	Whimbrel
	<i>Tringa brevipes</i>	Grey-tailed tattler

Family	Scientific Name	Common Name
HAEMATOPODIDAE	<i>Haematopus longirostris</i>	Pied Oystercatcher
	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher
CHARADRIIDAE	<i>Pluvialis squatarola</i>	Grey Plover
	<i>Charadrius leschenaultii</i>	Greater Sand Plover
	<i>Charadrius mongolus</i>	Lesser Sand Plover
	<i>Charadrius ruficapillus</i>	Red-capped Plover
	<i>Charadrius veredus</i>	Oriental Plover
	<i>Euseyornis melanops</i>	Black-fronted Dotterel
GLAREOLIDAE	<i>Sterna caspia</i>	Caspian Tern
	<i>Sterna albifrons</i>	Little Tern
	<i>Sterna bergii</i>	Crested Tern
	<i>Sterna bengalensis</i>	Lesser Crested Tern
	<i>Sterna hybrida</i>	Whiskered Tern
	<i>Sterna nereis</i>	Fairy Tern
	<i>Sterna nilotica</i>	Gull-billed Tern
	<i>Larus novaehollandiae</i>	Silver Gull
COLUMBIDAE	<i>Geopelia cuneata</i>	Diamond Dove
	<i>Geophaps plumifera</i>	Spinifex Pigeon
	<i>Geopelia striata placida</i>	Peaceful Dove
	<i>Ocyphaps lophotes</i>	Crested Pigeon
CACATUIDAE	<i>Cacatua roseicapilla</i>	Galah
	<i>Cacatua sanguinea</i>	Little Corella
PSITTACIDAE	<i>Melopsittacus undulatus</i>	Budgerigar
	<i>Nymphicus hollandicus</i>	Cockatiel
CUCULIDAE	<i>Chrysococcyx basalis</i>	Horsfield's Bronze-Cuckoo

Family	Scientific Name	Common Name
	<i>Cuculus pallidus</i>	Pallid Cuckoo
CENTROPIDAE	<i>Centropus phasianus</i>	Pheasant Coucal
TYTONIDAE	<i>Tyto alba</i>	Barn Owl
PODARGIDAE	<i>Podargus strigoides</i>	Tawny Frogmouth
CAPRIMULGIDAE	<i>Eurostopodus argus</i>	Spotted Nightjar
AEGOTHELIDAE	<i>Aegotheles cristatus</i>	Australian Owlet Nightjar
HALCYONIDAE	<i>Todiramphus chloris</i>	Collared Kingfisher
	<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher
	<i>Todiramphus sanctus</i>	Sacred Kingfisher
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater
MALURIDAE	<i>Malurus lamberti</i>	Variegated Fairy-wren
	<i>Malurus leucopterus</i>	White-winged Fairy-wren
PARDALOTIDAE	<i>Pardalotus rubricatus</i>	Red-browed Pardalote
	<i>Gerygone tenebrosa</i>	Dusky Gerygone
MELIPHAGIDAE	<i>Certhionyx niger</i>	Black Honeyeater
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater
	<i>Lichenostomus virescens</i>	Singing Honeyeater
	<i>Lichmera indistincta</i>	Brown Honeyeater
	<i>Manorina flavigula</i>	Yellow-throated Miner
PETROICIDAE	<i>Eopsaltria pulverulenta</i>	Mangrove Robin
PACHYCEPHALIDAE	<i>Pachycephala lanioides</i>	White-breasted Whistler
	<i>Pachycephala melanura</i>	Mangrove Golden Whistler
DICRURIDAE	<i>Grallina cyanoleuca</i>	Magpie-Lark
	<i>Rhipidura phasiana</i>	Mangrove Grey Fantail
	<i>Rhipidura leucophrys</i>	Willie Wagtail

Family	Scientific Name	Common Name
CAMPEPHAGIDAE	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
	<i>Lalage tricolor</i>	White-winged Triller
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow
	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow
	<i>Artamus superciliosus</i>	White-browed Woodswallow
CORVIDAE	<i>Corvus orru</i>	Torresian Crow
HIRUNDINIDAE	<i>Hirundo ariel</i>	Fairy Martin
	<i>Hirundo nigricans</i>	Tree Martin
SYLVIIDAE	<i>Cincloramphus mathewsi</i>	Rufous Songlark
	<i>Cincloramphus cruralis</i>	Brown Songlark
	<i>Eremiornis carteri</i>	Spinifex Bird
ALAUIDAE	<i>Mirafra javanica</i>	Singing Bushlark
PASSERIDAE	<i>Emblema pictum</i>	Painted Finch
	<i>Taeniopygia guttata</i>	Zebra Finch
MOTACILLIDAE	<i>Anthus novaeseelandiae</i>	Australian Pipit
ZOSTEROPIDAE	<i>Zosterops luteus</i>	Yellow White-eye

Appendix K2 - Bird Species Inventory for Summer Survey

Family	Scientific Name	Common Name
PHASIANIDAE	<i>Coturnix ypsilophora</i>	Brown Quail
ANATIDAE	<i>Anas superciliosa</i>	Pacific Black Duck
	<i>Anas gracilis</i>	Grey Teal
	<i>Aythya australis</i>	Hardhead
	<i>Cygnus atratus</i>	Black Swan
	<i>Dendrocygna eytoni</i>	Plumed Whistling-duck
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck

Family	Scientific Name	Common Name
PODICIPEDIDAE	<i>Tachybaptus novaehollandiae</i>	Australia Grebe
ANHINGIDAE	<i>Anhinga melanogaster</i>	Darter
PHALACROCORACIDAE	<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant
	<i>Phalacrocorax varius</i>	Pied Cormorant
FREGATIDAE	<i>Fregata ariel</i>	Lesser Frigate Bird
PELECANIDAE	<i>Pelecanus conspicillatus</i>	Australian Pelican
ARDEIDAE	<i>Ardea novaehollandiae</i>	White-faced Heron
	<i>Ardea alba</i>	Great Egret
	<i>Butorides striatus</i>	Striated Heron
	<i>Egretta garzetta</i>	Little Egret
	<i>Egretta sacra</i>	Eastern Reef Egret
THRESKIORNITHIDAE	<i>Threskiornis molucca</i>	Australian White ibis
ACCIPITRIDAE	<i>Elanus caeruleus</i>	Black-shouldered Kite
	<i>Milvus migrans</i>	Black Kite
	<i>Haliastur indus</i>	Brahminy Kite
	<i>Haliastur sphenurus</i>	Whistling Kite
	<i>Circus assimilis</i>	Spotted Harrier
	<i>Aquila audax</i>	Wedge-tailed Eagle
	<i>Haliaeetus leucogaster</i>	White-breasted Sea Eagle
	<i>Hieraaetus morphnoides</i>	Little Eagle
	<i>Pandion haliaetus</i>	Osprey
FALCONIDAE	<i>Falco cenchroides</i>	Australian Kestrel
	<i>Falco berigora</i>	Brown Falcon
	<i>Falco longipennis</i>	Australian Hobby
OTIDAE	<i>Ardeotis australis</i>	Australian Bustard

Family	Scientific Name	Common Name
TURNICIDAE	<i>Turnix velox</i>	Little Button-quail
SCOLOPACIDAE	<i>Arenaria interpres</i>	Ruddy Turnstone
	<i>Calidris canutus</i>	Red Knot
	<i>Calidris ferruginea</i>	Curlew Sandpiper
	<i>Calidris ruficollis</i>	Red-necked Stint
	<i>Calidris tenuirostris</i>	Great Knot
	<i>Actitis hypoleucos</i>	Common Sandpiper
	<i>Xenus cinereus</i>	Terek Sandpiper
	<i>Tringa nebularia</i>	Common Greenshank
	<i>Limosa lapponica</i>	Bar-tailed Godwit
	<i>Numenius madagascariensis</i>	Eastern Curlew
	<i>Numenius phaeopus</i>	Whimbrel
<i>Tringa brevipes</i>	Grey-tailed tattler	
HAEMATOPODIDAE	<i>Haematopus longirostris</i>	Pied Oystercatcher
	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher
CHARADRIIDAE	<i>Pluvialis squatarola</i>	Grey Plover
	<i>Charadrius leschenaultii</i>	Greater Sand Plover
	<i>Charadrius mongolus</i>	Lesser Sand Plover
	<i>Charadrius ruficapillus</i>	Red-capped Plover
	<i>Charadrius veredus</i>	Oriental Plover
GLAREOLIDAE	<i>Sterna caspia</i>	Caspian Tern
	<i>Sterna albifrons</i>	Little Tern
	<i>Sterna bergii</i>	Crested Tern
	<i>Sterna bengalensis</i>	Lesser Crested Tern
	<i>Sterna hybrida</i>	Whiskered Tern

Family	Scientific Name	Common Name
	<i>Sterna nereis</i>	Fairy Tern
	<i>Sterna nilotica</i>	Gull-billed Tern
	<i>Larus novaehollandiae</i>	Silver Gull
COLUMBIDAE	<i>Geopelia cuneata</i>	Diamond Dove
	<i>Geophaps plumifera</i>	Spinifex Pigeon
	<i>Geopelia striata placida</i>	Peaceful Dove
	<i>Ocyphaps lophotes</i>	Crested Pigeon
CACATUIDAE	<i>Cacatua roseicapilla</i>	Galah
	<i>Cacatua sanguinea</i>	Little Corella
PSITTACIDAE	<i>Melopsittacus undulatus</i>	Budgerigar
	<i>Nymphicus hollandicus</i>	Cockatiel
CUCULIDAE	<i>Chrysococcyx basalis</i>	Horsfield's Bronze-Cuckoo
CENTROPIDAE	<i>Centropus phasianus</i>	Pheasant Coucal
TYTONIDAE	<i>Tyto alba</i>	Barn Owl
PODARGIDAE	<i>Podargus strigoides</i>	Tawny Frogmouth
CAPRIMULGIDAE	<i>Eurostopodus argus</i>	Spotted Nightjar
HALCYONIDAE	<i>Todiramphus chloris</i>	Collared Kingfisher
	<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher
	<i>Todiramphus sanctus</i>	Sacred Kingfisher
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater
MALURIDAE	<i>Malurus lamberti</i>	Variegated Fairy-wren
	<i>Malurus leucopterus</i>	White-winged Fairy-wren
PARDALOTIDAE	<i>Pardalotus rubricatus</i>	Red-browed Pardalote
	<i>Gerygone tenebrosa</i>	Dusky Gerygone
MELIPHAGIDAE	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater

Family	Scientific Name	Common Name
	<i>Lichenostomus virescens</i>	Singing Honeyeater
	<i>Lichmera indistincta</i>	Brown Honeyeater
	<i>Manorina flavigula</i>	Yellow-throated Miner
PETROICIDAE	<i>Eopsaltria pulverulenta</i>	Mangrove Robin
PACHYCEPHALIDAE	<i>Pachycephala lanioides</i>	White-breasted Whistler
	<i>Pachycephala melanura</i>	Mangrove Golden Whistler
DICRURIDAE	<i>Grallina cyanoleuca</i>	Magpie-Lark
	<i>Rhipidura phasiana</i>	Mangrove Grey Fantail
	<i>Rhipidura leucophrys</i>	Willie Wagtail
CAMPEPHAGIDAE	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
	<i>Lalage tricolor</i>	White-winged Triller
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow
	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow
CORVIDAE	<i>Corvus orru</i>	Torresian Crow
HIRUNDINIDAE	<i>Hirundo ariel</i>	Fairy Martin
	<i>Hirundo nigricans</i>	Tree Martin
SYLVIIDAE	<i>Cincloramphus mathewsi</i>	Rufous Songlark
	<i>Cincloramphus cruralis</i>	Brown Songlark
	<i>Eremiornis carteri</i>	Spinifex Bird
ALAUIDAE	<i>Mirafrja javanica</i>	Singing Bushlark
PASSERIDAE	<i>Taeniopygia guttata</i>	Zebra Finch
MOTACILLIDAE	<i>Anthus novaeseelandiae</i>	Australian Pipit
ZOSTEROPIDAE	<i>Zosterops luteus</i>	Yellow White-eye

Appendix K3 - Bird Species Inventory for Winter Survey

Family	Scientific Name	Common Name
CASUARIIDAE	<i>Dromaius novaehollandiae</i>	Emu
PODICIPEDIDAE	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe
PHALACROCORACIDAE	<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant
	<i>Phalacrocorax varius</i>	Pied Cormorant
PELECANIDAE	<i>Pelecanus conspicillatus</i>	Australian Pelican
ARDEIDAE	<i>Ardea alba</i>	Great Egret
	<i>Ardea novaehollandiae</i>	White-faced Heron
	<i>Egretta garzetta</i>	Little Egret
	<i>Egretta sacra</i>	Eastern Reef Egret
THRESKIORNITHIDAE	<i>Threskiornis molucca</i>	Australian White ibis
ACCIPITRIDAE	<i>Aquila audax</i>	Wedge-tailed Eagle
	<i>Elanus caeruleus</i>	Black-shouldered Kite
	<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle
	<i>Haliastur indus</i>	Brahminy Kite
	<i>Haliastur sphenurus</i>	Whistling Kite
	<i>Hieraaetus morphnoides</i>	Little Eagle
	<i>Milvus migrans</i>	Black Kite
FALCONIDAE	<i>Falco cenchroides</i>	Australian Kestrel
	<i>Falco berigora</i>	Brown Falcon
OTIDIDAE	<i>Ardeotis australis</i>	Australian Bustard
SCOLOPACIDAE	<i>Arenaria interpres</i>	Ruddy Turnstone
	<i>Numenius phaeopus</i>	Whimbrel
	<i>Tringa brevipes</i>	Grey-tailed Tattler
	<i>Tringa stagnatilis</i>	Marsh Sandpiper

Family	Scientific Name	Common Name
	<i>Xenus cinerus</i>	Terek Sandpiper
HAEMATOPODIDAE	<i>Haematopus longirostris</i>	Pied Oystercatcher
	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher
CHARADRIIDAE	<i>Charadrius leschenaultii</i>	Greater Sand Plover
	<i>Euseyornis melanops</i>	Black-fronted Dotterel
LARIDAE	<i>Larus novaehollandiae</i>	Silver Gull
	<i>Sterna albifrons</i>	Little Tern
	<i>Sterna bengalensis</i>	Lesser Crested Tern
	<i>Sterna caspia</i>	Caspian Tern
	<i>Sterna nilotica affinis</i>	Gull-billed Tern
COLUMBIDAE	<i>Geopelia cuneata</i>	Diamond Dove
	<i>Geophaps plumifera</i>	Spinifex Pigeon
	<i>Geopelia striata placida</i>	Peaceful Dove
	<i>Ocyphaps lophotes</i>	Crested Pigeon
CACATUIDAE	<i>Cacatua roseicapilla</i>	Galah
	<i>Cacatua sanguinea</i>	Little Corella
	<i>Melopsittacus undulatus</i>	Budgerigar
	<i>Nymphicus hollandicus</i>	Cockatiel
CUCULIDAE	<i>Cuculus pallidus</i>	Pallid Cuckoo
CAPRIMULGIDAE	<i>Eurostopodus argus</i>	Spotted Nightjar
AEGOTHELIDAE	<i>Aegotheles cristatus</i>	Australian Owlet Nightjar
HALCYONIDAE	<i>Todiramphus chloris</i>	Collared Kingfisher
	<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher
	<i>Todiramphus sanctus</i>	Sacred Kingfisher
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater

Family	Scientific Name	Common Name
MALURIDAE	<i>Malurus lamberti</i>	Variegated Fairy-wren
	<i>Malurus leucopterus</i>	White-winged Fairy-wren
MELIPHAGIDAE	<i>Certhionyx niger</i>	Black Honeyeater
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater
	<i>Lichenostomus virescens</i>	Singing Honeyeater
	<i>Lichmera indistincta</i>	Brown Honeyeater
	<i>Manorina flavigula</i>	Yellow-throated Miner
PETROICIDAE	<i>Eopsaltria pulverulenta</i>	Mangrove Robin
PACHYCEPHALIDAE	<i>Pachycephala lanioides</i>	White-breasted Whistler
DICRURIDAE	<i>Grallina cyanoleuca</i>	Magpie-Lark
	<i>Rhipidura phasiana</i>	Mangrove Grey Fantail
	<i>Rhipidura leucophrys</i>	Willie Wagtail
CAMPEPHAGIDAE	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
	<i>Lalage tricolor</i>	White-winged Triller
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow
	<i>Artamus superciliosus</i>	White-browed Woodswallow
CORVIDAE	<i>Corvus orru</i>	Torresian Crow
HIRUNDINIDAE	<i>Hirundo ariel</i>	Fairy Martin
	<i>Hirundo nigricans</i>	Tree Martin
SYLVIIDAE	<i>Eremiornis carteri</i>	Spinifex Bird
ALAUIDAE	<i>Mirafra javanica</i>	Singing Bushlark
PASSERIDAE	<i>Emblema pictum</i>	Painted Finch
	<i>Taeniopygia guttata</i>	Zebra Finch
MOTACILLIDAE	<i>Anthus novaseelandiae</i>	Australian Pipit
ZOSTEROPIDAE	<i>Zosterops luteus</i>	Yellow White-eye

Appendix K4 - Bird Species Inventory for Additional Areas

Family	Scientific Name	Common Name
ACCIPITRIDAE	<i>Aquila audax</i>	Wedge-tailed Eagle
	<i>Haliastur indus</i>	Brahminy Kite
FALCONIDAE	<i>Falco berigora</i>	Brown Falcon
CACATUIDAE	<i>Cacatua roseicapilla</i>	Galah
	<i>Melopsittacus undulatus</i>	Budgerigar
	<i>Nymphicus hollandicus</i>	Cockatiel
MEROPIDAE	<i>Merops ornatus</i>	Rainbow Bee-eater
MALURIDAE	<i>Malurus leucopterus</i>	White-winged Fairy-wren
MELIPHAGIDAE	<i>Lichenostomus virescens</i>	Singing Honeyeater
ARTAMIDAE	<i>Artamus cinereus</i>	Black-faced Woodswallow
CORVIDAE	<i>Corvus orru</i>	Torresian Crow
HIRUNDINIDAE	<i>Hirundo nigricans</i>	Tree Martin
PASSERIDAE	<i>Taeniopygia guttata</i>	Zebra Finch

APPENDIX L

**BIRDS AUSTRALIA RECORDS OF
SHOREBIRD SIGHTINGS IN
WESTERN AUSTRALIA**

**OUTER HARBOUR DEVELOPMENT
FAUNA ASSESSMENT**

APPENDIX L

Birds Australia Records of Shorebird Sightings in Western Australia

Shorebird Area	Years summer counts	Years winter counts	# Top 30 species	Banded Stilt	Bar-tailed Godwit	Black-fronted Dotterel	Black-tailed Godwit	Black-winged Stilt	Broad-billed Sandpiper	Common Greenshank	Common Sandpiper	Curlew Sandpiper	Double-banded Plover	Eastern Curlew	Great Knot	Greater Sandplover	Grey Plover	Grey-tailed Tattler	Hooded Plover	Latham's Snipe	Lesser Sandplover	Marsh Sandpiper	Masked Lapwing	Oriental Plover	Pacific Golden Plover	Pectoral Sandpiper	Pied Oystercatcher	Red Knot	Red-capped Plover	Red-kneed Dotterel	Red-necked Avocet	Red-necked Stint	Ruddy Turnstone	Sanderling	Sharp-tailed Sandpiper	Sooty Oystercatcher	Terek Sandpiper	Whimbrel	
80 Mile Beach	15	14	22	0	23023	0	21	6	40	897	2	1618	0	137	36568	11665	338	4222	0	0	65	80	0	12359	29	0	54	4429	1376	0	0	5992	199	269	41	1	3463	27	
Roebuck Bay	18	15	22	0	11415	0	2311	39	68	147	11	1183	0	241	9985	3137	200	1013	0	0	127	1	0	322	8	0	92	1417	491	0	2	3091	455	103	29	22	570	250	
Dampier Saltworks	5	1	19	86	250	0	40	97	61	59	1	842	0	15	109	126	31	28	0	0	23	56	0	322	6	0	2	70	1169	0	112	4781	22	1	940	0	0	35	
Lake MacLeod	3	0	14	34214	163	5	0	462	1	178	6	21154	N/A	0	157	176	17	5	0	0	1	2	0	18	2	0	5	129	1103	0	906	3383	26	2	356	0	1	0	
Peel & Yalgorup Lakes	9	5	12	7192	29	3	1	891	1	58	3	149	0	3	35	2	14	1	23	0	0	11	0	0	4	3	2	40	528	0	475	2954	0	1	630	0	0	0	
Swan River & Rottnest Island	23	22	9	1832	9	0	1	56	0	10	2	166	0	0	38	0	42	3	0	0	0	0	0	0	0	17	34	3	136	0	11	1072	149	45	19	0	0	1	
Swan Coastal Plain Lakes	14	11	8	192	0	16	0	1822	0	33	0	178	0	0	0	0	1	0	0	0	0	5	0	0	0	1	0	0	535	2	450	1097	0	0	191	0	0	0	
Albany	23	17	7	44	33	0	0	25	0	60	2	69	0	1	275	36	76	7	1	0	1	1	0	0	15	0	41	144	39	0	18	792	5	0	18	2	0	1	
Nuytsland Nature Reserve	12	11	7	6	4	12	0	2	1	6	2	3	3	0	3	1	12	1	1	0	0	0	0	31	2	1	4	18	146	0	1	78	13	9	18	41	0	0	
Wilson Inlet	24	13	7	307	6	0	0	114	0	122	0	235	0	0	2	0	2	0	0	0	0	1	0	0	3	1	3	1	317	0	414	1475	0	0	100	0	0	0	
Lacepedes Islands	1	0	5	0	0	0	2	0	0	2	0	80	N/A	0	0	400	0	680.0**	0	0	12	0	0	0	270.0**	0	0	8	0	0	0	0	480	630.0^	5.0**	0	0	0	0
Port Hedland	3	0	5	203	83	0	0	20	225	12	0	192	N/A	1	0	29	1	1	0	0	2	1	0	18	1	0	0	15	0	14	1023	3	0	104	0	0	1		
Vasse-Wonnerup Estuary	8	1	5	1026	1	20	0	607	0	31	2	101	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	308	0	585	653	0	0	201	0	0	0	
Broadwater (Busselton)	2	0	4	12.5^	0	0	0	194.5^	0	18	0	34	N/A	0	0	0	0	0	0	0	215.0^	0	1	0	0	0	0	0	40	0	307.5^	40	0	0	121	0	0	0	
Finucane Island	3	2	4	0	8	0	0	0	0	11	0	3	0	1	47	3	1	7	0	0	0	0	0	6	0	0	2	2	2	0	0	17	11	0	0	3	10	8	
Hutt Lagoon	3	2	3	14	0	0	0	35	0	0	4	25	0	0	0	5	10	0	0	0	0	0	0	0	5	0	4	0	120	0	32	222	39	0	23	1	0	0	
Warden Lakes (Esperance)	4	5	3	950	1	5	0	5	0	35	3	19	60	0	0	0	0	0	106	0	0	0	0	0	0	0	0	13	53	0	37	265	0	0	51	0	0	0	
Cooke Point	4	1	2	0	0	0	0	53	0	6	2	21	0	0	0	1	1	50	0	0	0	1	0	24	2	0	0	0	2	0	0	6	82	0	9	0	0	0	
Esperance	4	2	2	0	0	2	0	0	0	0	1	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	6	0	30	0	0	12	0	14	0	13	0	0	
Garden Island	5	2	2	0	1	0	0	0	0	0	1	0	0	0	34	2	8	1	0	0	1	0	0	0	0	0	13	55	6	0	0	2	20	43	0	2	0	0	
Lake Gore	3	4	2	378	0	0	0	0	0	6	1	7	0	0	0	0	0	0	131	0	0	0	0	0	0	0	0	0	165	0	3	237	0	0	0	0	0	0	

Shorebird Area	Years summer counts	Years winter counts	# Top 30 species	Banded Stilt	Bar-tailed Godwit	Black-fronted Dotterel	Black-tailed Godwit	Black-winged Stilt	Broad-billed Sandpiper	Common Greenshank	Common Sandpiper	Curlew Sandpiper	Double-banded Plover	Eastern Curlew	Great Knot	Greater Sandplover	Grey Plover	Grey-tailed Tattler	Hooded Plover	Latham's Snipe	Lesser Sandplover	Marsh Sandpiper	Masked Lapwing	Oriental Plover	Pacific Golden Plover	Pectoral Sandpiper	Pied Oystercatcher	Red Knot	Red-capped Plover	Red-kneed Dotterel	Red-necked Avocet	Red-necked Stint	Ruddy Turnstone	Sanderling	Sharp-tailed Sandpiper	Sooty Oystercatcher	Terek Sandpiper	Whimbrel	
Woodman Point	7	4	1	2	1	0	0	0	1	0	1	0	0	0	7	0	9	0	0	0	0	0	0	0	0	0	14	3	15	2	6	2	14	17	0	0	1	0	
Cape Gordon to Cape Villaret	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herdsmen Lake	5	4	0	0	1	4	0	20	0	1	1	14	0	0	10	0	10	0	0	0	0	0	0	0	0	0	3	9	0	2	245	0	0	5	0	0	0	0	
Yokinup	1	0	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	0	4	0	0	0	0	0	0	0	2	0	0	0	6	0	0	0	0	1	0	0		
Shark Bay	3	1	N/A	0	83	1	0	6	0	17	2	1	0	4	23	44	4	31	0	0	0	0	0	0	0	11	10	75	0	3	211	6	2	0	0	0	9		

NB: Tabulated information provide to ENV Australia Pty LTD from Sinclair Knight Merz PTY Limited.

Explanation of Table and values

This table lists all the "shorebird areas" for which we have count data in the National Shorebird Database.

The values listed under each species represent the maximum annual summer count (Nov-Feb) recorded in each shorebird area, averaged across the years for which data is available (≥ 1980).

For Double-banded Plover, winter counts (May-August) have been used instead of summer counts.

(the number of years for which summer and winter count data is available is shown for each shorebird area)

For each species, the 30 shorebird areas with the largest mean counts have been identified.

These shorebird areas (termed the "Top 30" for each species) are indicated by pale orange cells

When identifying the "Top 30" shorebird areas for each species, two rules were applied:

- 1) Species had to be recorded at the shorebird area in ≥1/3 of the years for which data was available
- 2) The value for mean count (of maximum summer counts across years) had to be ≥ 5

For some species, less than 30 shorebird areas had been identified after this process was completed.

In these cases, the first rule was dropped and additional shorebird areas were included (starting again at the top of the list, as ordered by mean count) in the "Top 30" list until 30 areas were identified.

The second rule was still applied in these situations.

Shorebird areas in which species have been recorded at a mean count of ≥ 5, but *do not* form a "Top 30" area, are indicated by pale yellow cells

For each shorebird area, the number of species for which it forms a "Top 30" area is also shown.