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# 360

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## Learmonth Level 1 Fauna Survey

Prepared for:

Subsea 7

October 2017



● people ● planet ● professional

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## Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by Subsea7 to undertake a Level 1 Fauna Survey of a potential site for the fabrication and launch of bundles, at Learmonth, Exmouth. The purpose of the survey was to help determine the environmental values within and in proximity to the proposed development envelope.

The Survey Area was 374 ha in size, located approximately 35 km south of the Exmouth town site, in the Carnarvon biogeographic region of Western Australia.

A Department of Parks and Wildlife (DPaW, now the Department of Biodiversity Conservation and Attractions) threatened fauna database radial search (5 km), a *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (10km) and a NatureMap search were undertaken to identify fauna species of conservation significance potentially occurring in the Survey Area.

Database searches returned 158 vertebrate species from 59 families as potentially occurring in the vicinity of the Survey Area. Of these, 39 were reptiles from ten families, 83 were bird species from 32 families and 36 were mammals from 17 families.

A total of 47 conservation significant species (including Priority species) were considered to potentially occur in the Survey Area. These 47 species comprised two reptile, 43 bird and two mammal species.

During the field assessment 40 species from 29 families were recorded. This consisted of five reptile species from five families, 29 bird species from 20 families and six mammal species from four families. Six conservation significant species were recorded; the Osprey, Lesser Sand Plover, Caspian Tern, Lesser Crested Tern, Crested Tern and Rainbow Bee-eater. No 'critical habitat' for any of these species was recorded within the Survey Area.

Fifteen fauna habitat assessments were undertaken during the survey and three broad fauna habitats were identified and mapped coarsely (Beach, Hummock Grassland and Tecticornia Shrubland).

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# 1 Introduction

## 1.1 The Project

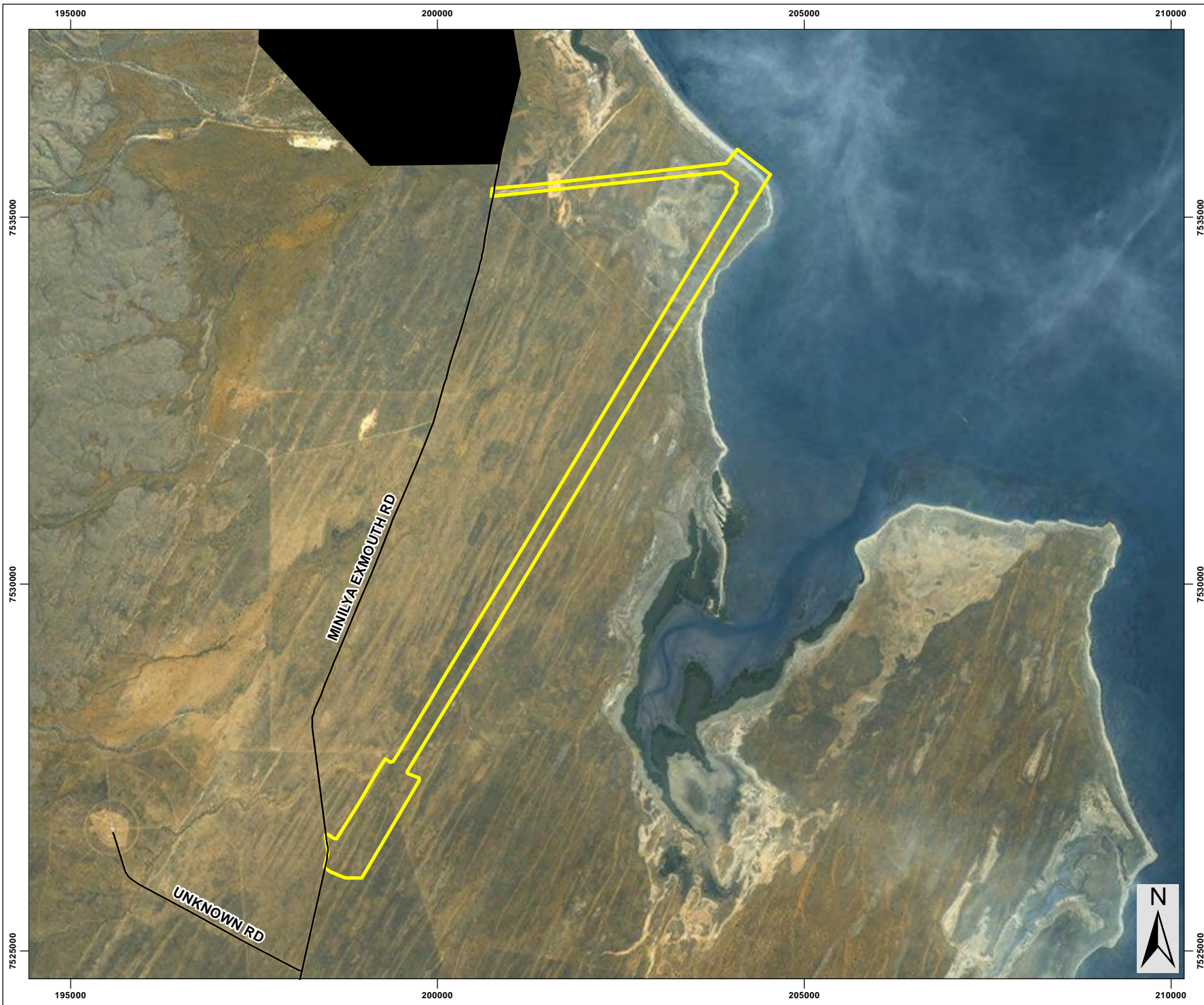
360 Environmental Pty Ltd (360 Environmental) was commissioned by Subsea7 to undertake a Level 1 Fauna Survey for a site located at Learmonth. The purpose of the assessment was to determine the environmental values within and in proximity to the proposed development envelope.

The Survey Area is 374 ha in size, located approximately 35 km south of the Exmouth town site, in the Carnarvon biogeographic region of Western Australia.

### 1.1.1 Objectives

The objectives of the fauna survey were to:

- Complete a desktop review;
- Undertake a level 1 fauna survey; and
- Prepare a report documenting the results of the desktop review and field assessment.



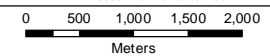
**Legend**

- Survey Area
- Learmonth RAAF Base
- Roads

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS  
 - LOCALITY MAP SOURCED LANDGATE 2006  
 - CADASTRE SOURCED FROM LANDGATE  
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE Sep 2013  
 - © Western Australian Land Information Authority 2017

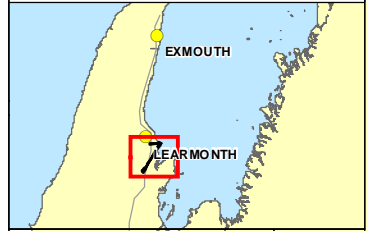
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**LOCALITY MAP**



PROJECT ID 2061		DATE 30/06/2017	
HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50			
CREATED MH	CHECKED AD	APPROVED SS	REVISION 0

**Subsea 7  
 Bundle Site, Learmonth  
 Fauna Survey**

**Figure 1  
 Site Location**



## 1.2 Background to the Protection of Fauna

Western Australian fauna is protected formally and informally by various legislative and non-legislative measures, including:

Legislative measures:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*;
- *WA Biodiversity Conservation Act 2016 (BC Act)*;
- *WA Wildlife Conservation Act 1950 (WC Act)*; and
- *Environmental Protection Act 1986 (EP Act)*.

Non-legislative measures:

- Western Australian Department of Biodiversity Conservation and Attractions Priority lists for fauna; and
- Recognition of locally significant populations by the Department of Biodiversity Conservation and Attractions.

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix A.

### 1.2.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance, which are detailed in Appendix A. Under the EPBC Act, the Commonwealth Department of the Environment and Energy (DEE) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are considered to be conservation significant if they are listed as Threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Migratory.

Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds which migrate between Australia and other countries, for which Australia has agreed. This includes the: Japan-Australia Migratory Bird Agreement (JAMBA); China-Australia Migratory Bird Agreement (CAMBA); Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA); and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e. any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas the EPBC Act does not consider these species to be matters of national environmental significance, so

are not protected under the Act. As such species only listed as Marine under the EPBC Act have not been considered to be conservation significant in this assessment.

### 1.2.2 WC Act

The WA Department of Biodiversity Conservation and Attractions lists taxa under the provisions of the WC Act as protected and are classified as Schedule 1 to Schedule 7 according to their need for protection (see Appendix A). The WC Act makes it an offence to 'take' threatened species without an appropriate licence. There are financial penalties for contravening the WC Act.

### 1.2.3 EP Act

Significant habitat necessary for the maintenance of fauna indigenous to Western Australia as well as TECs are given special consideration in environmental impact assessment, and areas covered by TECs have special status as Environmentally Sensitive Areas (ESAs) under the EP Act, and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

### 1.2.4 Department of Biodiversity Conservation and Attractions Priority Lists

The Department of Biodiversity Conservation and Attractions lists 'Priority' fauna that have not been assigned statutory protection as 'Scheduled' under the WC Act, but which are under consideration for declaration as 'Scheduled' fauna. Fauna assessed as Priority 1-3 are considered to be species with poorly known populations on threatened lands, on conservation lands, or with poorly known populations some on conservation lands. Priority 4 fauna are species in need of monitoring: not currently threatened or in need of special protection, but could become so and usually represented on conservation lands. Priority 5 fauna are species in need of monitoring: not considered threatened, but the subject of a specific conservation programme, the cessation of which would result in the species becoming threatened within five years (Appendix A).

In addition, the Department of Biodiversity Conservation and Attractions maintains a list of Priority Ecological Communities which identifies those communities that need further investigation before possible nomination for TEC status.

Although Department of Biodiversity Conservation and Attractions Priority species and communities have no formal legal protection, they are under consideration as 'Scheduled' taxa under the WC Act or as ESAs under the EP Act Informal Recognition of Fauna.

### 1.2.5 Informal Recognition of Fauna

Certain populations may be of local significance or interest because of their patterns of distribution and abundance. For example, specific locations of fauna may be locally significant because they are range extensions to the previously known distribution, or are

newly discovered species (and have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (e.g. land clearing, grazing and changed fire regimes), and relict populations of such species assume local importance for the Department of Biodiversity Conservation and Attractions.

## 2 Biophysical Environment

### 2.1 Climate

The closest long term official Bureau of Meteorology (BoM) weather station currently operating near to the Survey Area is at Learmonth Airport (Station number 5007), approximately 2.5 km to the north of the Survey Area.

Learmonth Airport recorded 269.30 mm of rain in the 12 months prior to the survey (May 2016 – April 2017). This is 43.7 mm above the long term average rainfall of 260.7 mm for the same period (BoM 2017). For the three months prior to the survey Exmouth recorded 62 mm of rainfall, 38.2% (38.3 mm) below the 100.3 mm long term average rainfall for the same period (Figure 2) (BoM 2017).

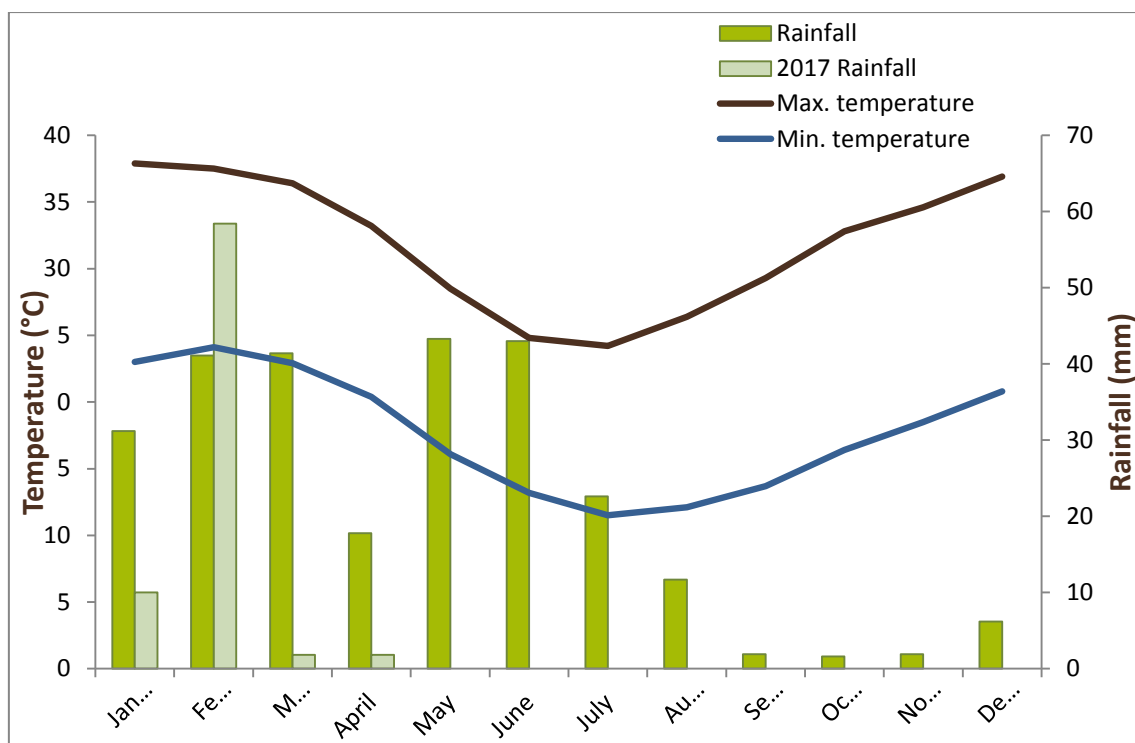


Figure 2: Mean Rainfall (from 1975 to 2017) for Learmonth (5007) (BoM 2017).

### 2.2 Biogeographic Regionalisation for Australia

The Biogeographic Regionalisation of Australia (IBRA7) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework. The Survey Area lies within the Carnarvon Bioregion and Cape Range subregion (Figure 3).

The Carnarvon bioregion is composed of quaternary alluvial, aeolian and marine sediments overlying Cretaceous strata. A mosaic of saline alluvial plains with samphire

and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, Snakewood scrub on clay flats and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with *Acacia stuartii* or *A. bivenosa* shrubland outcrop in the north, where extensive tidal flats in sheltered embayments support Mangal (Kendrick & Mau 2002).

## 2.3 Broad Vegetation

Mapping of the vegetation of the Pilbara region which included the Survey Area was completed on a broad scale (1:1,000,000) by Beard (1975). These vegetation units were later re-assessed by Shepherd *et al.* (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

The Shepherd *et al.* (2001) vegetation type in the Survey Area (along with the corresponding Beard [1975] type, in brackets), is described below:

- **117 (Coastal Dunes) (a3Srt1hi)** – Hummock grasslands, grass steppe; soft spinifex; and
- **662 (Coastal Dunes) (anSZrt1,2Hi)** – Hummock grassland; shrub steppe; mixed *Acacia* scrub and dwarf scrub with soft spinifex and *Triodia basedowii*.

## 2.4 Previous Biological Studies

There have been a limited number of on ground and desktop assessments surrounding the Survey Area in the recent past. 360 Environmental was commissioned in 2015 to undertake a Level 1 Flora, Vegetation and Fauna Assessment for Lots 1403 and 1404 Truscott Crescent, Exmouth (about 35 km north of this current Survey Area). The Survey Area was one of five proposed caravan park sites. Given this is a fauna assessment we will only summarise the results of the fauna components of this previous work.

**Table 1: Summary of previous fauna surveys undertaken in the region**

\*Conservation significance is based on listing as of submission date on report and includes species listed as Priority species by DPaW, Scheduled under the WC act and threatened under the EPBC Act.

REFERENCE	SURVEY TYPE	SURVEY DATE	PROXIMITY TO SURVEY AREA	METHODS	HABITATS PRESENT	*CONSERVATION SIGNIFICANT SPECIES
Tourism WA Level 1 Flora, Vegetation and Fauna Assessment for Lots 1403 and 1404 Truscott Crescent, Exmouth.(360 2015)	Level 1 Survey	6-7 May 2015	The area assessed is approximately 35 km to the north of the Survey Area	Desktop assessment - database searches and field survey	Sand Dune Acacia shrublands Buffel grassland	Three conservation significant species were recorded during the survey: <ul style="list-style-type: none"> <li>• Osprey (<i>Pandion cristatus</i>), which was observed perching in the Survey Area</li> <li>• Rainbow Bee-eater (<i>Merops ornatus</i>) a number of which were observed foraging in the Survey Area.</li> <li>• Star Finch (<i>Neochmia ruficauda subclarescens</i>) was observed perched in the Survey Area.</li> </ul>

## 3 Methods

### 3.1 Background

The fauna survey was compliant with the EPA requirements for the environmental surveying and reporting of fauna in Western Australia and EPBC Act survey and referral guidelines, where practical and relevant, and follows:

- Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3 (EPA 2002);
- Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56 (EPA 2004);
- Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA-DEC 2010);
- Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2 (2010) (DSEWPaC);
- Survey Guidelines for Australia's Threatened Frogs. EPBC Act survey guidelines 6.3 (2010) (DSEWPaC);
- Survey Guidelines for Australia's Threatened Mammals. EPBC Act survey guidelines 6.5 (2011) (DSEWPaC); and
- Survey Guidelines for Australia's Threatened Reptiles. EPBC Act survey guidelines 6.6 (2011) (DSEWPaC).

### 3.2 Fauna Survey Methods

#### 3.2.1 Fauna Database Review

A 5 km DPaW threatened fauna database search, and a 10 km NatureMap and EPBC Protected Matters Search Tool (PMST) radial search were each undertaken (Appendix B). The searches were undertaken to identify fauna species of conservation significance potentially occurring in the Survey Area (DPaW 2017a; DPaW 2017b and DEE 2017).

Collectively, these sources were used to compile a list of species that have been previously recorded in the vicinity of the Survey Area (Appendix C). This list invariably includes some species that do not occur in the Survey Area, as some fauna have a limited or patchy distribution or a high level of habitat specificity for habitats which are not located in the Survey Area e.g. waders/shorebirds that require coastal shores for habitat. Some fauna may also have become locally extinct or were erroneously identified

in previous surveys. These fauna were examined and then excluded from the list where relevant.

### 3.2.2 Field assessment

The field assessment was undertaken from 13 to 16 June 2017 by two Zoologists. The survey was consistent with standard protocols for the region and relevant EPA Guidance Statements and EPBC Act Survey Guidelines as outlined above in section 3.1 (where relevant and practical).

The purpose of the field assessment was to verify the accuracy of the desktop assessment and to further delineate and characterise the fauna assemblages and fauna habitat in the Survey Area.

To verify the accuracy of the background research, the field component of the Level 1 fauna survey incorporated the following tasks:

- Utilising passive sampling which included:
  - Hand foraging for inactive and/or cryptic species (raking leaf litter, searching under rocks and logs and under loose litter);
  - Looking for scats, pellets, skeletal material, tracks, diggings; and
  - Opportunistic observations (visual or heard) of active species, in particular birds.
- Assessment of the habitat (within the Survey Area) to support species protected under State and/or Federal legislation or by the DPaW as a Priority species was undertaken.

Amphibians, reptiles and mammals are mainly recorded through intensive trapping (level 2 type surveys) and are infrequently recorded opportunistically. However, these animals will be noted when active, or by identifiable signs such as scats, tracks and diggings.

### 3.2.3 Habitat Assessments

Habitat assessments were undertaken throughout the Survey Area to define and delineate (map habitats) the main habitats present (Figures 4a & 4b).

Each habitat description will include the following information:

- GPS co-ordinate will be recorded;
- Habitat condition will be assessed as 'completely degraded through to pristine, based on the scale given in Keighery (1994);
- Landscape position;
- Dominant vegetation and structure e.g. number of vegetation strata;



- Hollow-bearing trees and dead stags (e.g. average size and abundance of hollows);
- Description of any rock and rocky outcrops;
- Logs (e.g. abundance and size);
- Substrate (e.g. leaf litter);
- Wetlands, creeks, rivers, dams and other water bodies;
- Description of any observed nests and roosts;
- Subterranean roosts (e.g. caves, disused mineshafts and/or adits);
- Associated fauna species observed using the habitat;
- Disturbance e.g. cattle grazing, fire; and
- Photo showing a typical example of the broad habitat type.

#### 3.2.4 Nocturnal Spotlighting

Spotlighting and head torching at night from vehicles and on foot is an important survey tool as much of the region's fauna is nocturnal and/or crepuscular, particularly conservation significant species. Nocturnal searches were conducted (two Zoologists searching for 60 minutes each, over two nights), totalling 240 minutes. In addition, spotlighting was also conducted from the vehicle while driving to the Survey Area and between spotlighting areas.

#### 3.2.5 Bat Monitoring

Song Meter 2 (SM2) acoustic recording units were set up in suitable habitat at night to target micro-bat species. SM2 units were set up at two different locations (Figures 4a & 4b) and Plate 1).



Plate 1: An example of an SM2 Unit

### 3.2.6 Camera Traps

Camera traps were setup during the field survey at eight separate locations for two nights per location (Table 2, Figures 4a & 4b) and Plate 2). Camera traps were baited with sardines and universal bait (peanut butter, oats and water) and placed in their field of view. Cameras were used to target species of conservation significance that may occur in the Survey Area.

**Table 2: Motion sensitive camera locations (co-ordinates are in UTM's [GDA94])**

CAMERA NUMBER	EASTING	NORTHING	DATES PLACED OUT
1	201998	7535474	13 – 15/06/17
2	202895	7535572	13 – 15/06/17
3	204181	7535618	13 – 15/06/17
6	202958	7533162	13 – 15/06/17
8	199375	7527066	14 – 16/06/17
9	199300	7527300	14 – 16/06/17
10	198634	7526316	14 – 16/06/17
12	199650	7527725	14 – 16/06/17



**Plate 2: An example of a Motion Sensitive Camera**

### 3.2.7 Taxonomy

For species identified in the desktop assessment, where there is doubt as to their true taxonomy (through subsequent name changes or taxonomic reviews), an effort was made to determine the current scientific name for each species. In some cases, old scientific names may be presented where correct nomenclature could not be determined due to name changes. Some taxon names may be followed by 'sp.', meaning that the species name was not given in the data source or the identification is in doubt. Where there are

previously recorded species such as this that have the potential to be a conservation significant species, they are discussed specifically in the results and discussion section.

Taxonomy and nomenclature in this report follows the accepted listing of published terrestrial vertebrate species. The listing for amphibians and reptiles follows Cogger (2014), birds follows Christidis & Boles (2008) and mammals Van Dyck & Strahan (2008).

## 4 Results

### 4.1 Fauna Survey Limitations and Constraints

It is important to note the specific constraints imposed on surveys and these constraints are often difficult to predict, as is the extent to which they influence survey effort. Survey constraints of the fauna assessment are listed below in Table 3.

**Table 3: Limitations and Constraints Associated with the Survey Area.**

VARIABLE	IMPACT ON SURVEY OUTCOMES
Access	The Survey Area is 347 ha. The overall area was surveyed in a broad and general capacity, with all major habitats sampled and mapped.
Experience	The personnel who executed the survey were practitioners suitably qualified in their respective fields:  Field Zoologists: Dr Ron Firth (18 years' experience) and Laura Stevens (5 years' experience);  Data interpretation and reporting: Laura Stevens  Report review: Dr Ron Firth.
Timing, weather, season	The survey was conducted from 13 to 16 June 2017. Rainfall prior to the survey was below the long-term average. During the survey weather conditions such as maximum and minimum temperatures were close to the long-term average. Given this, weather is unlikely to have impacted on the results of the survey to any significant extent, particularly as the assessment was a Level 1 (a reconnaissance survey with no trapping).
Scope: Life forms sampled	The scope of this project was to undertake a Level 1 fauna survey (reconnaissance survey and an assessment of habitats in the Survey Area). Given the level of survey, many species that occur in the Survey Area would not have been observed, particularly small ground-dwelling fauna that are normally captured by methods such as trapping. All conservation significant species previously recorded in the area have been considered. Based on the habitat present, those species deemed to potentially occur in the Survey Area have been addressed in this study.
Sources of information	The fauna desktop analysis used several sources to produce a list of fauna species previously recorded in the vicinity of the Survey Area. This included threatened fauna

VARIABLE	IMPACT ON SURVEY OUTCOMES
	database (DPaW 2017a), NatureMap (DPaW 2017b) and the EPBC PMST (DEE 2017), as well as past reports, field guides and other scientific literature.
Completeness	A total 158 fauna species were recovered from database searches and a total of 97 species were recorded during the survey. SM2 units were placed out at two locations and camera traps at 10 locations for two nights each. A total of 240 minutes of spotlighting were undertaken. A total of 15 fauna habitat assessments were carried out.
Disturbances	Much of the Survey Area is considered to be in Excellent condition, although sheep are present throughout the Survey Area.

## 4.2 Fauna Results

### 4.2.1 Database Searches

Database searches returned 158 vertebrate species from 59 families as potentially occurring in the vicinity of the Survey Area. Of these, 39 were reptiles from 10 families, 83 were bird species from 32 families and 36 were mammals from 17 families.

A total of 84 conservation significant vertebrate species (including Priority species) from 30 families were identified during the desktop review of the database searches (Appendix B). These were comprised of 20 reptile species from six families, 44 bird species from 14 families and 20 mammals from 10 families.

### 4.2.2 Conservation Significant Fauna

All three database searches (Department of Biodiversity Conservation and Attractions threatened fauna, NatureMap and EPBC PMST) returned a number of wetland species, in particular marine reptiles and mammals. These species require specific habitats (i.e. oceans) that are not present in the Survey Area and have been omitted from any further discussion.

A number of species returned from the database searches were also known to be historical records of species now extinct e.g. Burrowing Bettong (*Bettongia Lesueur*), Broad-faced Potoroo (*Potopus platyops*) and Lesser Stick-nest Rat (*Leporillus apicalis*) or extinct in the local area and or more broadly in the region e.g. Northern Quoll (*Dasyurus hallucatus*) and Shark Bay Mouse (*Pseudomys fieldi*). Also, some records were only returned from the DPaW threatened fauna database, some of which were single records or undated records, these species have been omitted from any further discussion.

Occasionally there are inconsistencies in the database searches, for example, the Grey Wagtail has only two confirmed sightings in north-west WA (Johnstone & Storr 2004) yet it was present in the EPBC PMST and the Yellow Wagtail (*Motacilla flava*) requires edges of swamps, sewage ponds and salt-marshes (Pizzey 1997). These habitats are not present in the Study Area. As such these species have been omitted from any further discussion. The Barrow Island Golden Bandicoot (*Isodon auratus barrowensis*), is found exclusively on Barrow Island, which is approximately 200 km north-east of the Survey Area, this species has therefore been omitted from any further discussion.

It is important to note, that the EPBC PMST is not entirely based on point records, but also on broader information, for example bioclimatic distribution models. The Department of Biodiversity Conservation and Attractions threatened fauna database and NatureMap are based on point records. Consequently, the results of the EPBC PMST are in some cases less accurate, particularly at a local scale. Consequently, the EPBC PMST will include species that do not occur in the search area because for example there is no habitat or they are now known to be locally extinct.

In addition, many fauna are not distributed evenly across the landscape, are more abundant in some places than others are, and consequently more detectable (Currie 2007). Furthermore, some small, common ground-dwelling reptile and mammal species tend to be habitat specific, and many bird species can occur as regular migrants, occasional visitors or vagrants. Therefore all these species have been omitted from any further discussion regarding fauna results.

With the afore mentioned species removed, a total of 47 conservation significant species (including Priority species) from the database searches are potentially considered to either be Likely, Possibly or Unlikely to occur in the Survey Area. These 47 species comprise two reptile, 43 bird and two mammal species.

Of these 47 conservation significant species, six species were recorded during the field survey, one species is considered 'Likely', 26 species are considered 'Possible' and 16 species are considered 'Unlikely' to occur within the Survey Area (Table 4).

The Likelihood of each species is based on the following criteria:

- Recorded: Recorded during the field survey;
- Likely: Suitable habitat is present in the Survey Area and the Survey Area is in the species' known distribution;
- Possible: Limited or no suitable habitat is present in Survey Area, but is nearby. The species has good dispersal abilities and is known from the general area; and
- Unlikely: No suitable habitat is present in Survey Area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however, the Survey Area is outside of the species' known distribution.

**Table 4: Conservation significant fauna potentially occurring in the Survey Area**

En = Listed as Endangered under the EBPC Act, Vu = Listed as Vulnerable under the EBPC Act, Mi = Listed as Migratory under the EBPC Act, Ma = Listed as Marine under the EBPC Act, S = Scheduled under the WC Act, and P = Listed as Priority by the DPaW.

SPECIES	CONSERVATION STATUS	LIKELIHOOD
<b>Reptiles</b>		
Cape Range Stone Gecko ( <i>Diplodactylus capensis</i> )	P2	Unlikely
Cape Range Slider ( <i>Lerista allochira</i> )	P3	Unlikely
<b>Birds</b>		
Seabirds (various)	MiMa, S5	Possible
Coastal Waders (various)	MiMa, S5	Recorded
Fork-tailed Swift ( <i>Apus pacificus</i> )	MiMa, S5	Unlikely
Eastern Great Egret ( <i>Ardea modesta</i> )	Ma, S5	Unlikely
Cattle Egret ( <i>Ardea ibis</i> )	Ma, S5	Unlikely
Little Egret ( <i>Egretta garzetta</i> )	Ma, S5	Unlikely
Night Parrot ( <i>Pezoporus occidentalis</i> )	En	Unlikely
Rainbow Bee-eater ( <i>Merops ornatus</i> )	Ma, S5	Recorded
Barn Swallow ( <i>Hirundo rustica</i> )	MiMa, S4	Unlikely
<b>Mammals</b>		
Pilbara Leaf-nosed Bat ( <i>Rhinioncteris aurantia</i> )	Vu	Unlikely
Black-flanked Rock-wallaby ( <i>Petrogale lateralis lateralis</i> )	Vu	Unlikely

#### 4.2.3 Field Assessment Results

During the field assessment 40 species from 29 families were recorded. This consisted of five reptile species from five families, 29 bird species from 20 families and six mammal species from four families (Appendix C).

##### 4.2.3.1 Amphibians

From the database searches, no amphibian species have been previously recorded in the Survey Area (Appendix B). During the survey, no amphibians were recorded.

##### 4.2.3.2 Reptiles

From the database searches, a total of 39 reptile species have been previously recorded from the following 10 families in the surrounding area; Cheloniidae, Dermochelyidae, Diplodactylidae, Pygopodidae, Gekkonidae, Scincidae, Agamidae, Varanidae, Boidae and Elapidae. During the field assessment two reptile species were directly recorded; the Tree Dtella (*Gehyra variegata*) and Stimpson's Python (*Antaresia stimpsoni*). Three



reptile families were directly or indirectly (signs such as burrows) recorded during the survey but could not be attributed to species level because they were seen scurrying; a number of Skink (*Ctenotus* sp.), Dragon (*Ctenophorus* sp.) and Varanid (likely Gould's Sand Monitor [*Varanus gouldii*] burrows were also observed in the Survey Area (Appendix C).

#### 4.2.3.3 Birds

From the database searches, a total of 83 bird species from 32 families have been previously recorded in the surrounding area. During the field assessment 29 bird species were recorded from the following 20 families: Casuariidae, Columbidae, Accipitridae, Falconidae, Haematopodidae, Charadriidae, Laridae, Cacatuidae, Psittacidae, Maluridae, Meliphagidae, Campephagidae, Artamidae, Cracticidae, Rhipiduridae, Monarchidae, Corvidae, Meglauridae, Estrildidae, and Motacillidae (Appendix C).

#### 4.2.3.4 Mammals

From the database searches, a total of 36 mammal species from 17 families have been previously recorded in the surrounding area. During the field assessment six mammal species were recorded; the Western Grey Kangaroo (*Macropus fuliginosus*), Common Sheath-tailed Bat (*Taphozous georgianus*), Gould's Wattled Bat (*Chalinolobus gouldii*), Little Broad-nosed Bat (*Scotorepens greyii*), Finlayson's Cave Bat (*Vespadelus finlaysoni*) and the introduced European Rabbit (*Oryctolagus cuniculus*) (Appendix C).

#### 4.2.4 Fauna Habitat

In total 15 fauna habitat assessments were undertaken during the survey and three broad fauna habitats were identified and mapped coarsely (Table 5, Appendix D and Figures 4a & 4b).

**Table 5: Fauna Habitat in the Survey Area.**

FAUNA HABITAT	AREA (HA)	AREA (%)
Beach	7.1	1.9
Hummock Grassland	349.4	93.4
Tecticornia Shrubland	13.1	3.5
Cleared / track	4.6	1.2
<b>Total</b>	<b>374.2</b>	<b>100</b>

## 5 Discussion

### 5.1 Fauna of Conservation Significance

#### 5.1.1 Species Recorded

During the field assessment, six conservation significant species were recorded; the Osprey, Lesser Sand Plover, Caspian Tern, Lesser Crested Tern, Crested Tern and Rainbow Bee-eater.

##### **Osprey (*Pandion cristatus*)**

The Osprey is listed as marine and migratory under the EPBC Act. Coastal birds such as the Osprey require coasts and near-coastal wetland habitat, including estuaries, bays, inlets, islands and surrounding waters; coral atolls, reefs, lagoons, rock cliffs and stacks. The Osprey is moderately common to very common in sheltered seas around northern Australia and the West coast (and islands) south to 31°S (Garnett *et al.* 2011).

The Osprey feeds mainly on fish, including banded sweep, buff-bream, pike, garfish, smelt, groper, herring and mullet. Also sea snakes from Shark Bay northwards and nesting seabirds (including White-faced Storm-petrels and Bridled Terns) and large lizards (Johnstone & Storr 1998).

There are no records of the Osprey in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area. However, it was present in the EPBC protected matters report and NatureMap results. The Osprey was observed flying over the Survey Area on a number of occasions. No nesting site was noted within the Survey Area.

The Osprey forages in marine/aquatic environments, therefore any loss of vegetation associated with the proposed works will not impact this species.

##### **Coastal Waders:**

- Lesser Sand Plover (*Charadrius mongolus*)
- Caspian Tern (*Hydroprogne caspia*)
- Lesser Crested Tern (*Thalasseus bengalensis*)
- Crested Tern (*Thalasseus bergii*)

The Survey Area contains a small amount (7.12 ha) of beach habitat. Suitable habitat is therefore present for all of the four species of wader recorded during the survey. While these species are all Recorded in the Survey Area, it is important to note that only 7.12 ha (or an approximately 600 m long section of beach) of the Survey Area contains suitable habitat, and as such the impact of the proposed project on these species is therefore very limited, particularly at the regional scale.

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

The Rainbow Bee-eater is listed as Marine under the EPBC Act and Schedule 5 under the WC Act. This species is one of the most common and widespread birds in Australia with a distribution that covers the majority of Australia (Barrett *et al.* 2003). It occurs in lightly wooded, often sandy country, preferring areas near water. It feeds on airborne insects, and nests throughout its range in WA, in burrows excavated in sandy ground or banks, often at the margins of roads and tracks. In WA this species can occur as a 'resident, breeding visitor, postnuptial nomad, passage migrant and winter visitor' (Johnstone & Storr 2004).

The Department of Biodiversity Conservation and Attractions threatened fauna database returned 5 records of the Rainbow Bee-eater. The species was observed on the wing and heard calling on numerous occasions throughout the Survey Area.

#### 5.1.2 Species Considered as Possibly Occurring

A total of 26 species are considered as Possibly occurring in the Survey Area.

#### Coastal Birds

All three database searches returned a number of wetland avifauna species, in particular coastal birds (i.e. waders) that require specific habitats (i.e. shorelines). There is a small area of beach habitat in the Survey Area that contains shoreline. Habitat is therefore present for all of these species, a number of which were recorded during the survey (Appendix C and Section 5.1.1). While these species are all considered Possible in the Survey Area, it is important to note that database searches returned limited records of these species. In addition only 7.12 ha of the entire Survey Area contains suitable habitat, and as such the impact of the proposed project on this habitat is limited, particularly at the regional scale given the extensive areas of shoreline in the local area and more broadly in the region. These species include:

- Greater Sand Plover (*Charadrius leschenaultii*)
- Lesser Sand Plover (*Charadrius mongolus*)
- Oriental Plover (*Charadrius veredus*)
- Grey Plover (*Pluvialis squatarola*)
- Oriental Pratincole (*Glareola maldivarum*)
- Common Noddy (*Anous stolidus*)
- Sooty Tern (*Sterna fuscata*)
- Australian Fairy Tern (*Sternula nereis*)
- Common Sandpiper (*Actitis hypoleucos*)
- Ruddy Turnstone (*Arenaria interpres*)

- Sharp-tailed Sandpiper (*Calidris acuminata*)
- Red Knot (*Calidris canutus*)
- Curlew Sandpiper (*Calidris ferruginea*)
- Pectoral Sandpiper (*Calidris melanotos*)
- Red-necked Stint (*Caliris ruficollis*)
- Great Knot (*Calidris tenuirostris*)
- Bar-tailed Godwit (*Limosa lapponica*)
- Bar-tailed Godwit (Western Alaskan) (*Limosa lapponica bauera*)
- Bar-tailed Godwit (Northern Siberian) (*Limosa lapponica menzbieri*)
- Eastern Curlew (*Numenius madagascariensis*)
- Whimbrel (*Numenius phaeopus*)
- Grey-tailed tattler (*Tringa brevipes*)
- Wood Sandpiper (*Tringa glareola*)
- Common Greenshank (*Tringa nebularia*)

#### **Barn Swallow (*Hirundo rustica*)**

The Barn Swallow is listed as Migratory and Marine under the EPBC Act and as Schedule 4 under the WC Act. It is an uncommon to locally common summer visitor, mainly to coastal areas of north WA and south to Learmonth, inhabiting towns and wetlands (Johnstone & Storr 1998).

There are no records of the Barn Swallow in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area, but it was present in the EPBC protected matters report, which as noted in Section 4.2.2 is not entirely based on point records, but also on broader information, for example bioclimatic distribution models. Whereas the Department of Biodiversity Conservation and Attractions NatureMap and threatened fauna databases are based on point records.

Although there are a lack of Department of Biodiversity Conservation and Attractions records for this species in Exmouth; there is suitable habitat, and the Survey Area is within the known distribution of the species. The Barn Swallow is therefore considered as Possibly occurring in the Survey Area.

#### **5.1.3 Species Considered as Unlikely to Occur**

A total of 16 species of conservation significance are considered Unlikely to occur in the Survey Area:

### **Cape Range Stone Gecko (*Diplodactylus capensis*)**

This species is listed as P2 under the Department of Biodiversity Conservation and Attractions Priority List.

The Cape Range Stone Gecko is a small to moderate size terrestrial gecko found in the northern end of North West Cape. Here it is found under debris, logs and rocks on limestone hills with spinifex and low shrubs and trees (Cogger 2014).

The Survey Area lacks limestone hills, has limited logs and rocks that provide shelter and foraging habitat. There were 29 records of the Cape Range Stone Gecko in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area. It is therefore considered Unlikely that the Cape Range Stone Gecko will occur in the Survey Area.

### **Cape Range Slider (*Lerista allochira*)**

This species is listed as P3 under the Department of Biodiversity Conservation and Attractions Priority List.

The Cape Range Slider is a burrowing species, which is usually found in loose soil or sand beneath stones, logs, termite mounds, etc., where they feed on ants, termites, and other small insects. At night they emerge to feed at the surface, immediately 'diving' into the loose sandy substrate when disturbed. This behaviour results in the distinctive disrupted wavy tracks which often criss-cross sand dunes (Cogger 2014).

The Cape Range Slider inhabits slopes and crests of heavily dissected limestone plateau sparsely vegetated with *Triodia* and shrubs. The Survey Area does not contain any suitable habitat.

There were 11 records of the Cape Range Slider in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area. However, given the absence of limestone slopes and dissected plateau the Cape Range Slider is considered Unlikely to occur in the Survey Area.

### **Night Parrot (*Pezoporus occidentalis*)**

The Night Parrot is listed as Endangered under the EPBC Act and Schedule 1 under the WC Act. It is an enigmatic species thought possibly to be extinct until the recent recoveries of two dead specimens from Queensland (and new locations more recently). The type specimen and many early sightings, however, came from WA (Johnstone *et al.* 2013). A more recent sighting of the Night Parrot in the Pilbara comes from 12 April 2005 at a well near the Fortescue Marshes (Davis & Metcalf 2008), followed by breeding observations at Pullen Pullen Reserve in Western Queensland (Murphy *et al.* 2017). This was followed more recently by a sighting near Matuwa (Lorna Glen), north-east of Wiluna, in 2009 (Hamilton *et al.* 2017).

The Department of Biodiversity Conservation and Attractions threatened fauna database has no records of the Night Parrot in the search area and there is very limited ecological

information available for this species such as its preferred habitat (only very broad information). However, with increasing conservation focus being given to this species, more information is likely to become available, e.g. the discovery of Night Parrot nests in large Spinifex hummocks in Queensland (Murphy *et al.* 2017) which is a common and widespread habitat type throughout much of south-east Queensland and WA, including the Survey Area. In March 2017, a population was observed and photographed at an interior salt lake in central Western Australia (at this stage no more details are available). There is an absence of nearby records and a very limited number of records in WA, consequently the Night Parrot is considered Unlikely in the Survey Area.

### Seabirds

The following seabirds are considered as Unlikely to occur in the Survey Area. They all require marine habitat and spend the majority of their lives at sea. The small amount of beach habitat in the Survey Area may be utilised by these species occasionally as part of a larger home range. They may fly overhead, however, they are unlikely to depend on this habitat and as such the proposed project is unlikely to have an impact on them, particularly at a regional scale. These species include:

- Southern Giant-Petrel (*Macronectes giganteus*)
- Flesh-footed Shearwater (*Ardenna carneipes*)
- Streaked Shearwater (*Calonectris leucomelas*)
- Wedge-tailed Shearwater (*Puffinus pacificus*)
- Campbell Albatross (*Thalassarche impavida*)
- Lesser Frigatebird (*Fregata ariel*)
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*)

### Fork-tailed Swift (*Apus pacificus*)

The Fork-tailed Swift is listed as Marine Migratory under the EPBC Act and as Schedule 5 under the WC Act. It is a non-breeding visitor to all states and territories of Australia (Higgins 1999). The Fork-tailed Swift is a summer migrant to Australia usually during the months of October-April. The Fork-tailed Swift is an aerial species which forages high above the tree canopy and is mostly independent of terrestrial habitats. It occurs in flocks of up to 2,000 birds and is often seen accompanying Tree Martins and Masked Wood swallows (Johnstone & Storr 1998).

There are no records of the Fork-tailed Swift in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area, but it was present in the EPBC protected matters report, which as noted in Section 4.2.2 is not entirely based on point records.

The Fork-tailed Swift is considered as Unlikely to occur in the survey area.

### **Eastern Great Egret (*Ardea modesta*)**

The Eastern Great Egret is listed as marine under the EPBC Act and as Schedule 5 under the WC Act. There are seven records (two of which are historical) of the Eastern Great Egret in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area.

The Eastern Great Egret occurs through the greater part of WA, but not the arid eastern interior south of Lake Gregory and east of Lake Nabberu. It is common in well-watered Kimberley flatlands, but scarce to moderately common everywhere else in WA.

The Eastern Great Egret is usually found in ones, twos or small flocks, occasionally in very large aggregations. The Eastern Great Egret inhabits mainly shallow freshwaters (river pools, lakes and lagoons), as well as shallow salt water including mangrove creeks and tidal pools.

Limited Department of Biodiversity Conservation and Attractions database returns and a lack of suitable freshwater habitat, result in the Eastern Great Egret being considered as Unlikely to occur in the Survey Area.

### **Cattle Egret (*Ardea ibis*)**

The Cattle Egret is listed as Marine under the EPBC Act and as Schedule 5 under the WC Act. It occurs casually in the wetter parts of WA. The species inhabits short grass, especially damp pastures and wetlands, usually in the company of cattle and occasionally other livestock. In WA it is an irregular visitor, occurring mostly in autumn, and is not thought to breed regularly (Johnstone & Storr 1998).

There are no records of the Cattle Egret in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area, but was present in the EPBC protected matters report.

Given the lack of records for this species in Exmouth and the lack of suitable habitat, the Cattle Egret is considered as Unlikely to occur in the survey area.

### **Little Egret (*Egretta garzetta*)**

The Cattle Egret is listed as Marine under the EPBC Act and as Schedule 5 under the WC Act. The species inhabits tidal mudflats, saltmarshes, mangroves, freshwater wetlands and sewage ponds (Pizzey 1997).

There are no records of the Little Egret in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area, but was present in the EPBC protected matters report.

Given the lack of records for this species in Exmouth and the lack of suitable habitat, the Little Egret is considered as Unlikely to occur in the survey area.

### **Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*)**

The Pilbara Leaf-nosed Bat is listed as Vulnerable under the EPBC Act and S3 under the WC Act.

The PLNB is dependent on caves and mines with very hot and humid roost sites (28-32°C and 96-100% humidity) during the dry season (Armstrong 2000; Churchill 2008). Caves and mines, which have these specific characteristics, are relatively uncommon in the Pilbara. Without these conditions, PLNB are susceptible to dehydration and hypothermia and can die within a few hours.

The PLNB is now known to be more widespread than previously supposed; however, most of its maternity roost sites are confined either to banded ironstone strata that may be mined or to underground mine adits that are now collapsing or being open cut (Woinarski et al. 2014).

There are no records of the Pilbara Leaf-nosed Bat in the Department of Biodiversity Conservation and Attractions threatened fauna database for the Exmouth area, but was present in the EPBC protected matters report.

Given the lack of records for this species in the area (and region) and the lack of suitable habitat, the Pilbara Leaf-nosed Bat is considered as Unlikely to occur in the survey area.

### **Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*)**

The Black-flanked Rock-wallaby is listed as Endangered under the EPBC Act.

Once patchily distributed but widespread throughout most of WA, the Black-flanked Rock-wallaby is now confined to small patches of suitable habitat. It has a very small area of occupancy and is severely fragmented with mostly small, isolated subpopulations. The Black-flanked Rock-wallaby inhabits rocky areas, caves, cliffs, screes and rock piles, where they shelter during the daytime. At dusk they emerge to feed on grasses, shrubs and occasionally seeds and fruits (Woinarski et al. 2012).

The Department of Biodiversity Conservation and Attractions threatened fauna database returned 18 records of the Black-flanked Rock-wallaby in the Exmouth area, however, they were all from nearby gorges. This habitat is not present in the Survey Area. This lack of suitable rocky habitat results in the Black-flanked Rock-wallaby being considered as Unlikely to occur in the Survey Area.



## 5.2 Fauna Habitat Types

Three fauna habitat types were identified in the survey area; Beach, Hummock Grassland and Tecticornia Shrubland. These habitats are widespread and common in the Exmouth region.

### Beach

Beach habitat comprised less than 2% of the Survey Area. This fauna habitat consists of a small area of sandy/shelly shoreline. This habitat provides foraging habitat in the form of shallow brackish water for coastal birds, such as the migratory birds returned from the database searches (for example Plovers, Sandpipers and Godwits) as well as those species recorded during the survey (Terns, Oystercatchers and Plover).

### Hummock Grassland

Hummock Grassland comprised 93% of the Survey Area. This fauna habitat consisted primarily of *Triodia* hummocks. In places there were various scattered *Acacia* species (including *A. gregorii*, *A. bivenosa*, *A. coriacea* and *A. tetragonophylla*). In places, this habitat is a mix of grasses which have dense lower strata, providing habitat with considerable cover for small reptile species, bird and mammal species, and areas with a less dense midstorey, but with an increased cover of grasses. This habitat has little woody debris and leaf litter, which would provide important microhabitat for some common reptile, bird and mammal species. Overall this habitat provides limited vegetation structure and hence limited fauna habitat for birds and mammals.

### Tecticornia Shrubland

Tecticornia Shrubland comprised approximately 4% of the Survey Area. The habitat lacks an overstorey or midstorey. The groundstorey is a mix of *Tecticornia* and *Frankenia* low shrubland on saline flats. This habitat provides limited foraging opportunities for a variety of small bird species, such as the Brown Song lark (*Cincloramphus cruralis*), which was recorded foraging in this habitat.

## 6 Summary

Fifteen fauna habitat assessments were undertaken during the survey and three broad fauna habitats were identified and mapped coarsely (Beach, Hummock Grassland and Tecticornia Shrubland).

A total of 47 conservation significant species (including Priority species) were considered to potentially occur in the Survey Area. These 47 species comprised two reptile, 43 bird and two mammal species.

During the field assessment 40 species from 29 families were recorded. This consisted of five reptile species from five families, 29 bird species from 20 families and six mammal species from four families. Six conservation significant species were recorded; the Osprey, Lesser Sand Plover, Caspian Tern, Lesser Crested Tern, Crested Tern and Rainbow Bee-eater. No 'critical habitat' for any of these species was recorded within the Survey Area.

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It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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# FIGURES



**Legend**

- Survey
- Learmonth RAAF Base

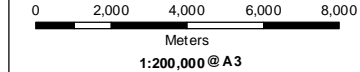
**IBRA7 Region**

- Carnarvon - Cape Range subregion

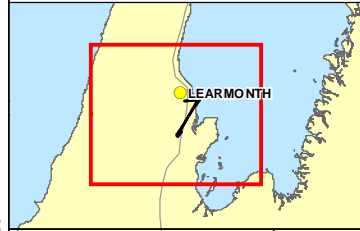
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS  
 - LOCALITY MAP SOURCED LANDGATE 2006  
 - IBRA7 REGIONS SOURCED DOE 2015  
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE Sep 2013  
 © Western Australian Land Information Authority 2017

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**LOCALITY MAP**



PROJECT ID 2198		DATE 30/06/2017	
HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50			
CREATED MH	CHECKED AD	APPROVED SS	REVISION 0

**Subsea 7  
 Bundle Site, Learmonth**

**Fauna Survey**

**Figure 3  
 IBRA 7 Regions**



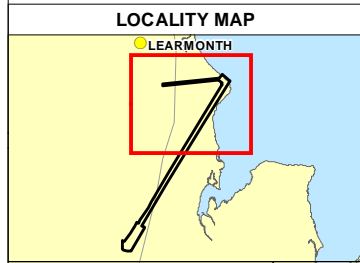
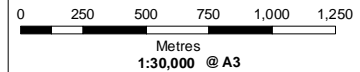


- Legend**
- Survey Area (374.29 ha)
  - Fauna Sites**
  - ▲ Habitat Assessment
  - Camera Trap
  - ★ SM2
  - Fauna Habitat**
  - Beach
  - Hummock Grassland
  - Tecticornia Shrubland
  - Cleared/Track

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS  
 - LOCALITY MAP SOURCED LANDGATE 2006  
 - IBRA7 REGIONS SOURCED DOE 2015  
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE Sep 2013  
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PROJECT ID 2198		DATE 10/08/2017	
HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50			
CREATED JA	CHECKED LS	APPROVED RF	REVISION 0

**Subsea 7  
 Bundle Site, Learmonth**

**Fauna Survey**

**Figure 4a  
 Fauna Survey**





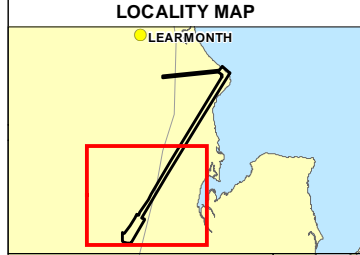
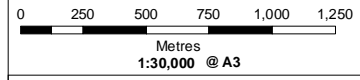


- Legend**
- Survey Area (374.29 ha)
  - ▲ Habitat Assessment
  - Camera Trap
  - ★ SM2
  - Fauna Habitat**
  - Hummock Grassland

-NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS  
 -LOCALITY MAP SOURCED LANDGATE 2006  
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<b>CREATED</b> JA	<b>CHECKED</b> LS	<b>APPROVED</b> RF	<b>REVISION</b> 0

**Subsea 7**  
**Bundle Site, Learmonth**  
**Fauna Survey**

**Figure 4b**  
**Fauna Survey**

# APPENDIX A

## Definition of Threatened Fauna Species Categories

### Western Australian Threatened Fauna Categories Wildlife Conservation Act 1950 (WA)

CATEGORY	CODE	DESCRIPTION
Schedule 1	S1	Rare or likely to become extinct as critically endangered fauna.
Schedule 2	S2	Fauna that is rare or is likely to become extinct as endangered fauna.
Schedule 3	S3	Fauna that is rare or is likely to become extinct as vulnerable fauna.
Schedule 4	S4	Fauna presumed to be extinct.
Schedule 5	S5	Migratory birds protected under an international agreement.
Schedule 6	S6	Fauna that is of special conservation need as conservation dependent fauna.
Schedule 7	S7	Other specially protected fauna

### Department of Parks and Wildlife 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.

### Categories of Threatened Fauna Species under the EPBC Act

CONSERVATION CODE	DESCRIPTION
<b>Ex</b>	<b>Extinct</b> Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
<b>ExW</b>	<b>Extinct in the Wild</b> Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

CONSERVATION CODE	DESCRIPTION
<b>CE</b>	<p><b>Critically Endangered</b></p> <p>Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.</p>
<b>E</b>	<p><b>Endangered</b></p> <p>Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.</p>
<b>V</b>	<p><b>Vulnerable</b></p> <p>Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.</p>
<b>CD</b>	<p><b>Conservation Dependent</b></p> <p>Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.</p>

Source: *Environment Protection and Biodiversity Conservation Act 1999*

# APPENDIX B

## Database Search Results



















Arenaria interpres interpres	24778	Scolopacidae	Arenaria	interpres	interpres	ruddy turnstone	Animalia	IA	BIRD	Moderately certain	Observational	1	EXMOUTH GULF	Doole Island	500	2001
Calidris acuminata	24779	Scolopacidae	Calidris	acuminata		sharp-tailed sandpiper	Animalia	IA	BIRD	Moderately certain	Observational	1	EXMOUTH GULF	Doole Island	500	2001
Limosa lapponica	30932	Scolopacidae	Limosa	lapponica		bar-tailed godwit	Animalia	IA (& VU at su	BIRD	Moderately certain	Observational	1	EXMOUTH GULF	Doole Island	500	2001
Pluvialis squatarola	24383	Charadriidae	Pluvialis	squatarola		grey plover	Animalia	IA	BIRD	Moderately certain	Observational	1	EXMOUTH GULF	Doole Island	500	2001
Glareola maldivarum	24481	Glareolidae	Glareola	maldivarum		oriental pratincole	Animalia	IA	BIRD	Moderately certain	Observational	1	EXMOUTH GULF	tidal flats Bullara station	100	2011
Calidris acuminata	24779	Scolopacidae	Calidris	acuminata		sharp-tailed sandpiper	Animalia	IA	BIRD	Moderately certain	Observational	1	LEARMONTH		18000	1978
Limosa lapponica	30932	Scolopacidae	Limosa	lapponica		bar-tailed godwit	Animalia	IA (& VU at su	BIRD	Moderately certain	Observational	1	LEARMONTH		18000	1978
Ardea modesta	41324	Ardeidae	Ardea	modesta		great egret, white egret	Animalia	IA	BIRD	Moderately certain	Observational	1	LEARMONTH		18000	1978
Calidris acuminata	24779	Scolopacidae	Calidris	acuminata		sharp-tailed sandpiper	Animalia	IA	BIRD	Moderately certain	Observational	1	LEARMONTH		18000	1978
Limosa lapponica	30932	Scolopacidae	Limosa	lapponica		bar-tailed godwit	Animalia	IA (& VU at su	BIRD	Moderately certain	Observational	1	LEARMONTH		18000	1978
Tringa glareola	24806	Scolopacidae	Tringa	glareola		wood sandpiper	Animalia	IA	BIRD	Moderately certain	Observational	1	LEARMONTH		18000	1978
Ardea modesta	41324	Ardeidae	Ardea	modesta		great egret, white egret	Animalia	IA	BIRD	Moderately certain	Observational	1	LEARMONTH		18000	1978
Arenaria interpres interpres	24778	Scolopacidae	Arenaria	interpres	interpres	ruddy turnstone	Animalia	IA	BIRD	Moderately certain	Observational	1	EXMOUTH GULF		18000	1981
Limosa lapponica	30932	Scolopacidae	Limosa	lapponica		bar-tailed godwit	Animalia	IA (& VU at su	BIRD	Moderately certain	Observational	1	EXMOUTH GULF		18000	1981
Merops ornatus	24598	Meropidae	Merops	ornatus		rainbow bee-eater	Animalia	IA	BIRD	Moderately certain	Observational	1	EXMOUTH GULF		18000	1977

# APPENDIX C

## Fauna Species List

Key: EPBC = Environmental Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DPaW = Department of Parks and Wildlife Priority Code, A = Listed in Naturemap, B = DEC Threatened and Priority fauna search, C = EPBC Protected Matters search, D = Current Survey

**Note:** For Definitions of Conservation Codes see Appendix A.

REPTILES		Conservation Codes						
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D
<b>CHELONIIDAE</b>								
<i>Caretta caretta</i>	Loggerhead Turtle	EN					X	
<i>Chelonia mydas</i>	Green Turtle	VU				X	X	
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	VU					X	
<i>Natator depressus</i>	Flatback Turtle	VU					X	
<b>DERMOCHELYIDAE</b>								
<i>Dermocheluyu coriacea</i>	Leatherback Turtle	EN				X	X	
<b>AGAMIDAE</b>								
<i>Amphibolurus longirostris</i>	Long-nosed Dragon				X			
<i>Ctenophorus sp.</i>	<i>Ctenophorus sp.</i>							X
<i>Ctenophorus clayi</i>	Collared Dragon				X			
<i>Ctenophorus femoralis</i>	Dune Dragon				X			
<i>Ctenophorus isolepis</i>	Military Sand Dragon				X			
<i>Ctenophorus nuchali</i>	Central Netted Dragon				X			
<i>Pogona minor</i>	Dwarf Bearded Dragon				X			
<b>DIPLODACTYLIDAE</b>								
<i>Diplodactylus capensis</i>	Cape Range Stone Gecko			P2		X		
<b>GEKKONIDAE</b>								
<i>Gehyra variegata</i>	Tree Dtella				X			X
<i>Hemidactylus frenatus</i>	Asian House Gecko				X		X	
<i>Heteronotia benoiei</i>	Bynoe's Gecko				X			
<b>PYGOPODIDAE</b>								
<i>Aprasia rostrata</i>	Monte Bellow Worm-lizard	VU				X		
<i>Lialis burtonis</i>	Burton's Snake Lizard				X			
<b>SCINCIDAE</b>								
<i>Ctenotus sp.</i>	<i>Ctenotus sp.</i>							X
<i>Ctenotus schomburgkii</i>	Schomburgks Ctenotus				X			
<i>Ctenotus saxatilis</i>	Rock Ctenotus				X			
<i>Cyclodomorphus melanops</i>	Slender Blue Tongue				X			
<i>Eremiascincus isolepis</i>	Northern Bar-lipped Skink				X			
<i>Lerista allochira</i>	Cape Range Slider			P3		X		



REPTILES		Conservation Codes						
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D
<i>Lerista petersoni</i>	Phantom Mole Slider				X			
<i>Lerista uniduo</i>	Spotted Broad-blazed Slider				X			
<i>Tiliqua multifasciata</i>	Central Blue-tongue				X			
<b>VARANIDAE</b>								
<i>Varanus gouldii</i>	Goulds Sand Monitor							X
<b>BOIDAE</b>								
<i>Antaresia stimsoni</i>	Stimson's Python							X
<b>ELAPIDAE</b>								
<i>Acalytophis peronii</i>	Horned Seasnake	Ma			X			
<i>Aipysurus apraefrontalis</i>	Short-nosed Sea Snake	CE				X	X	
<i>Aipysurus duboisii</i>	Dubois' Seasnake	Ma					X	
<i>Aipysurus eydouxii</i>	Spine-tailed Seasnake	Ma					X	
<i>Aipysurus laevis</i>	Olive Seasnake	Ma					X	
<i>Aipysurus stokesii</i>	Stokes' Seasnake	Ma					X	
<i>Emydocephalus annulatus</i>	Turtle-headed Seasnake	Ma					X	
<i>Ephalophis greyi</i>	Mangrove Seasnake	Ma			X		X	
<i>Hydrophis elegans</i>	Elegant Seasnake	Ma					X	
<i>Hydrophis kingii</i>	Spectacled Seasnake	Ma					X	
<i>Hydrophis major</i>	Olive-headed Seasnake	Ma					X	
<i>Pelamis platurus</i>	Yellow-bellied Seasnake	Ma					X	
<i>Pseudonaja mengdeni</i>	Western Brown Snake				X			
<i>Pseudonaja modesta</i>	Ringed Brown Snake				X			

[X] fauna species recorded.

[\*] denotes introduced species.

Key: EPBC = Environmental Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DPaW = Department of Parks and Wildlife Priority Code, A = Listed in Naturemap, B= DEC Threatened and Priority fauna search, C= EPBC Protected Matters search, D= Current Survey

**Note:** For Definitions of Conservation Codes see Appendix A.

BIRDS		Conservation Codes							
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D	
<b>CASUARIIDAE</b>									
<i>Dromaius novaehollandiae</i>	Emu							X	
<b>COLUMBIDAE</b>									
<i>Columba livia</i>	Rock Pigeon				X		X		
<i>Geopelia cuneata</i>	Diamond Dove							X	
<i>Geopelia humeralis</i>	Bar-shouldered				X				
<i>Ocyphaps lophotes</i>	Crested Pigeon							X	
<b>APODIDAE</b>									
<i>Apus pacificus</i>	Fork-tailed Swift	MiMa	S5				X		
<b>PROCELLARIIDAE</b>									
<i>Macronectes giganteus</i>	Southern Giant-Petrel	En					X		
<i>Ardeenna carneipes</i>	Flesh-footed Shearwater	MiMa	S5				X		
<i>Calonectris leucomelas</i>	Streaked Shearwater	MiMa	S5				X		
<i>Puffinus pacificus</i>	Wedge-tailed Shearwater		S5		X				
<b>DIOMEDEIDAE</b>									
<i>Thalassarche impavida</i>	Campbell Albatross	Vu					X		
<b>FREGATIDAE</b>									
<i>Fregata ariel</i>	Lesser Frigatebird	MiMa	S5				X		
<b>PHALACROCORACIDAE</b>									
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant				X				
<i>Phalacrocorax varius</i>	Pied Cormorant				X				
<b>PELECANIDAE</b>									
<i>Pelecanus conspicillatus</i>	Australian Pelican				X				
<b>CICONIIDAE</b>									
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork				X				
<b>ARDEIDAE</b>									
<i>Ardea modesta</i>	Eastern Great Egret	Ma	S5		X	X	X		
<i>Ardea ibis</i>	Cattle Egret	Ma	S5		X		X		
<i>Egretta garzetta</i>	Little Egret	Ma	S5		X				
<i>Egretta novaehollandiae</i>	White-faced Heron				X				
<b>ACCIPITRIDAE</b>									
<i>Aquila audax</i>	Wedge-tailed Eagle							X	

BIRDS		Conservation Codes						
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D
<i>Circus assimilis</i>	Spotted Harrier				X			X
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Ma			X		X	
<i>Haliastur indus</i>	Brahminy Kite				X			
<i>Haliastur sphenurus</i>	Whistling Kite				X			X
<i>Pandion cristatus</i>	Osprey	MiMa	S5		X		X	X
<b>FALCONIDAE</b>								
<i>Falco cenchroides</i>	Nankeen Kestrel				X			X
<b>GRUIFORMES</b>								
<i>Grus rubicunda</i>	Brolga				X			
<b>HAEMATOPODIDAE</b>								
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher				X			X
<i>Haematopus longirostris</i>	Pied Oystercatcher							X
<b>CHARADRIIDAE</b>								
<i>Charadrius leschenaultii</i>	Greater Sand Plover	Vu, MiMa	S3		X			
<i>Charadrius mongolus</i>	Lesser Sand Plover	En, MiMa	S5			X		X
<i>Charadrius ruficapillus</i>	Red-capped Plover				X			
<i>Charadrius veredus</i>	Oriental Plover	MiMa					X	
<i>Pluvialis squatarola</i>	Grey Plover	MiMa			X	X		
<b>GLAREOLIDAE</b>								
<i>Glareola maldivarum</i>	Oriental Pratincole	MaMi				X	X	
<b>LARIDAE</b>								
<i>Anous stolidus</i>	Common Noddy	MiMa					X	
<i>Chroicocephalus novaehollandiae</i>	Silver Gull				X			X
<i>Hydroprogne caspia</i>	Caspian Tern	MiMa			X	X	X	X
<i>Thalasseus bengalensis</i>	Lesser Crested Tern	Ma			X			X
<i>Thalasseus bergii</i>	Crested Tern	MiMa			X			X
<i>Sterna fuscata</i>	Sooty Tern	Ma					X	
<i>Sternula nereis</i>	Australian Fairy Tern	Ma			X	X	X	
<b>SCOLOPACIDAE</b>								
<i>Actitis hypoleucos</i>	Common Sandpiper	MaMi			X		X	
<i>Arenaria interpres</i>	Ruddy Turnstone	MaMi			X	X		
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MaMi			X	X	X	
<i>Calidris canutus</i>	Red Knot	En					X	
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE, MaMi			X		X	
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi					X	
<i>Caliris ruficollis</i>	Red-necked Stint	MaMi			X	X		
<i>Calidris tenuirostris</i>	Great Knot	CE, MaMi	S5		X			
<i>Limosa lapponica</i>	Bar-tailed Godwit	MaMi			X	X	X	
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit (Western Alaskan)	Vu					X	

BIRDS		Conservation Codes						
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D
<i>Limosa lapponica menzbieri</i>	Bar-tailed Godwit (Northern Siberian)	CE					X	
<i>Numenius madagascariensis</i>	Eastern Curlew	CE				X	X	
<i>Numenius phaeopus</i>	Whimbrel	MaMi				X		
<i>Tringa brevipes</i>	Grey-tailed tattler	MaMi		P4	X			
<i>Tringa glareola</i>	Wood Sandpiper	MaMi				X		
<i>Tringa nebularia</i>	Common Greenshank	MaMi			X	X	X	
<b>CACATUIDAE</b>								
<i>Melopsittacus undulatus</i>	Budgerigar							X
<b>PSITTACIDAE</b>								
<i>Eolophus roseicapillus</i>	Galah							X
<i>Pezoporus occidentalis</i>	Night Parrot	En					X	
<b>HALCYONIDAE</b>								
<i>Todiramphus chloris</i>	Collared Kingfisher				X			
<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher				X			
<i>Todiramphus sanctus</i>	Sacred Kingfisher				X			
<b>MEROPIIDAE</b>								
<i>Merops ornatus</i>	Rainbow Bee-eater	Ma	S5		X	X	X	
<b>MALURIDAE</b>								
<i>Malurus lamberti</i>	Variiegated Fairy-wren							X
<i>Malurus leucopterus</i>	White-winged Fairy-wren				X			
<b>ACANTHIZIDAE</b>								
<i>Gerygone tenebrosa</i>	Dusky Gerygone				X			
<b>MELIPHAGIDAE</b>								
<i>Epthianura aurifrons</i>	Orange Chat				X			
<i>Lichenostomus virescens</i>	Singing Honeyeater				X			X
<i>Lichmera indistincta</i>	Brown Honeyeater				X			
<i>Manorina flavigula</i>	Yellow-throated Miner				X			X
<b>CAMPEPHAGIDAE</b>								
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike				X			X
<b>PACHYCEPHALIDAE</b>								
<i>Colluricincla harmonica</i>	Grey Shrike-thrush				X			
<i>Pachycephala lanioides</i>	White-breasted Whistler				X			
<i>Pachycephala melanura</i>	Mangrove Golden Whistler				X			
<b>ARTAMIDAE</b>								
<i>Artamus leucorhynchus</i>	White-breasted Woodswallow				X			
<i>Artamus personatus</i>	Masked Woodswallow							X
<b>CRACTICIDAE</b>								
<i>Cracticus nigrogularis</i>	Pied Butcherbird							X
<b>RHIPIDURIDAE</b>								

BIRDS		Conservation Codes						
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D
<i>Rhipidura albiscapa</i>	Grey Fantail				X			
<i>Rhipidura leucophrys</i>	Willie Wagtail				X			X
<i>Rhipidura phasiana</i>	Mangrove Grey Fantail				X			
<b>MONARCHIDAE</b>								
<i>Grallina cyanoleuca</i>	Magpie-Lark							X
<b>CORVIDAE</b>								
<i>Corvus bennetti</i>	Little Crow				X			
<i>Corvus orru</i>	Torresian Crow							X
<b>PETROICIDAE</b>								
<i>Peneonanthus pulverulenta</i>	Mangrove Robin				X			
<b>MEGALURIDAE</b>								
<i>Cincloramphus cruralis</i>	Brown Songlark							X
<b>HIRUNDINIDAE</b>								
<i>Cheramoeca leucosterna</i>	White-backed Swallow				X			
<i>Hirundo neoxena</i>	Welcome Swallow				X			
<i>Hirundo rustica</i>	Barn Swallow	MiMa	S4				X	
<i>Petrochelidon nigricans</i>	Tree Martin				X			
<b>NECTARINIIDAE</b>								
<i>Dicaeum hirundinaceum</i>	Mistletoebird				X			
<b>ESTRILDIDAE</b>								
<i>Taeniopygia guttata</i>	Zebra Finch							X

Key: EPBC = Environmental Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DPaW = Department of Parks and Wildlife Priority Code, A = Listed in Naturemap, B = DEC Threatened and Priority fauna search, C = EPBC Protected Matters search, D = Current Survey

**Note:** For Definitions of Conservation Codes see Appendix A.

MAMMALS		Conservation Codes							
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D	
<b>DASYURIDAE</b>									
<i>Dasyurus hallucatus</i>	Northern Quoll	En					X		
<i>Phascogale calura</i>	Red-tailed Phascogale	Vu				X			
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart				P4	X			
<b>PERAMELIDAE</b>									
<i>Isoodon auratus barrowensis</i>	Barrow Island Golden Bandicoot	Vu	S3			X			
<b>POTOROIDAE</b>									
<i>Bettongia lesueur</i>	Burrowing Bettong	Ex	S4			X			
<i>Potopus platyops</i>	Broad-faced Potoroo	Ex	S4			X			
<b>MACROPODIDAE</b>									
<i>Macropus fuliginosus</i>	Western Grey Kangaroo							X	
<i>Petrogale lateralis lateralis</i>	Black-flanked Rock-wallaby	En				X	X		
<b>HIPPOSIDERIDAE</b>									
<i>Rhinonictis aurantia</i>	Pilbara Leaf-nosed Bat	Vu					X		
<b>EMBALLONURIDAE</b>									
<i>Taphozous georgianus</i>	Common Sheath-tailed Bat							X	
<b>VESPERTILIONIDAE</b>									
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat							X	
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat				X				
<i>Scotorepens greyii</i>	Little Broad-nosed Bat							X	
<i>Vespadelus finlaysoni</i>	Finlaysons Cave Bat							X	
<b>MURIDAE</b>									
<i>Leporillus apicalis</i>	Lesser Stick-nest Rat					X			
<i>Mesembriomys macrurus</i>	Golden-backed Tree-rat			P4		X			
* <i>Mus musculus</i>	House Mouse				X		X		
<i>Pseudomys chapmani</i>	Western Pebble-mouse	P4				X			
<i>Pseudomys fieldi</i>	Shark Bay Mouse	Vu				X			
<i>Rattus rattus</i>	Black rat				X		X		
<i>Rattus tunneyi</i>	Pale Field-rat				X				
<i>Zyomys pedunculatus</i>	Central Rock-rat	CE	S1			X			
<b>DUGONIDAE</b>									
<i>Dugong Dugon</i>	Dugong	MaMi	S		X	X	X		
<b>LEPORIDAE</b>									

MAMMALS		Conservation Codes							
Scientific Name	Common Name	EPBC	WC	DPaW	A	B	C	D	
* <i>Oryctolagus cuniculus</i>	European Rabbit				X		X	X	
<b>CANIDAE</b>									
* <i>Vulpes vulpes</i>	Red Fox				X		X		
<b>FELIDAE</b>									
* <i>Felis catus</i>	Feral Cat				X		X		
<b>EQUIDAE</b>									
* <i>Equus caballus</i>	Horse						X		
<b>BOVIDAE</b>									
<i>Capra hircus</i>	Goat						X		
<b>BALAENIDAE</b>									
<i>Eubalaena australis</i>	Southern Right Whale	Ma					X		
<b>BALAENOPTERIDAE</b>									
<i>Balaenoptera acutorostrata</i>	Minke Whale	Ma					X		
<i>Balaenoptera edeni</i>	Bryde's Whale	MiMa					X		
<i>Megaptera novaeangliae</i>	Humpback Whale	Vu			X	X	X		
<b>DELPHINIDAE</b>									
<i>Delphinus delphis</i>	Common Dolphin	Ma					X		
<i>Grampus griseus</i>	Risso's Dolphin	Ma					X		
<i>Orcaella heinsohni</i>	Australian Snubfin Dolphin			P4	X	X			
<i>Orcinus orca</i>	Orca	MiMa					X		
<i>Sousa chinensis</i>	Indo-Pacific Humpback Dolphin	MiMa		P4			X		
<i>Sousa sahalensis</i>	Australian humpback dolphin			P4		X			
<i>Stenella attenuata</i>	Spotted Dolphin	Ma					X		
<i>Stenella longirostris</i>	Spinner Dolphin					X			
<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	MiMa			X		X		

[X] fauna species recorded.

[\*] denotes introduced species.

# APPENDIX D

## Habitat Assessments



**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL  
(North West)**

Location: Exmouth - Subsea 7 Habitat Assessment: 1

Project: 2198

Date: 13/06/2017	Easting: 201998	<b>Aspect</b>	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7535474		E	S	W	N/A



<b>Soil Texture</b>	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Dune ridge	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.		2	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Other Grassland	Midstorey	/			0 <5%	1 <20%	2 20-60%	3 60-100%	
	Euc. Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

CONDITION						LAST FIRE				
<b>Scale:</b>	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr

General				DISTURBANCE				Cattle		
Tracks	0 heavy	1 medium *	2 mild (tracks)	3 none	0 heavy	1 medium	2 mild	3 none		

GROUND COVER									
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Prescence	0 none	1 rare	2 moderate	3 common	
Suitability for Bats	YES			NO		Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m
Caves	Absent	Present			Termite Mounds	0 none	1 rare	2 moderate	3 common	
					Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES									
Mulgara	YES	NO	<b>DETAILS</b>	Suitable habitat with sandy soil and within distribution but no signs					
Bilby	YES	NO		Outside of species distribution					
Quoll	YES	NO							
Pebble Mouse	YES	NO							

Birds		Mammals		Reptiles	
Zebra Finch	Yellow-throated Miner	Rabbit scats		G.variegata	
Singing Honeyeater	Variagated Fairy Wren				
Crow	Pied Butcherbird				
Crested Pigeon					

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**  
(North West)

Location: Exmouth - Subsea 7 Habitat Assessment: 2

Project: 2198

Date: 13/06/2017	Easting: 202895	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7535572		E	S	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation Description	Dune swale	Other:	Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum			Scattered Plants	Sparse	Moderate	Thick	
Riverine Woodland	Overstorey	Acacia sp.		2	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	/			0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc. Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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**General**

**DISTURBANCE**

**Cattle**

Tracks	0 heavy	1 medium *	2 mild (tracks)	3 none		0 heavy	1 medium	2 mild	3 none	
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**GROUND COVER**

Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%	
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%	
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%	
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%	

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

**SPECIES**

Mulgara	YES	NO	DETAILS	Suitable habitat with sandy soil and within distribution but no signs
Bilby	YES	NO		Outside of species distribution
Quoll	YES	NO		
Pebble Mouse	YES	NO		

Birds	Mammals	Reptiles
Emu	Cat	

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL  
(North West)**

Location: Exmouth - Subsea 7 Habitat Assessment: 3

Project: 2198

Date: 13/06/2017	Easting: 204181	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7535618		E	S	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation Description	Dune swale	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.			2	0 <5%	1 <20%	2 20-60%	3 60-100%
Other Grassland	Midstorey	Acacia sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%		
Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%		

**CONDITION**

**LAST FIRE**

Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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**General**

**DISTURBANCE**

**Cattle**

Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild (sheep)	3 none	
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**GROUND COVER**

	0	1	2	3		0	1	2	3
Bare Ground	<5%	<20%	20-60%	60-100%	Hummock Grass	<5%	<20%	20-60%	60-100%
Rock	<5%	<20%	20-60%	60-100%	Other Grass	<5%	<20%	20-60%	60-100%
Leaf Litter	<5%	<20%	20-60%	60-100%	Herbs	<5%	<20%	20-60%	60-100%
Logs >10cm	<5%	<20%	20-60%	60-100%	Other:	<5%	<20%	20-60%	60-100%

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

**SPECIES**

Mulgara	YES	NO	DETAILS	Suitable habitat with sandy soil and within distribution but no signs
Bilby	YES	NO		Outside of species distribution
Quoll	YES	NO		
Pebble Mouse	YES	NO		

Birds	Mammals	Reptiles
Zebra Finch	Sheep	
Variagated Fairy Wren		
Willie Wagtail		

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL  
(North West)**

Location: Exmouth - Subsea 7 Habitat Assessment: 4

Project: 2198

Date: 13/06/2017	Easting: 203950	<b>Aspect</b>	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7534800		E	S	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Dune ridge	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.		2	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Other Grassland	Midstorey	Acacia sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

CONDITION					LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr

General				DISTURBANCE			Cattle		
Tracks	0 heavy	1 medium *	2 mild	3 none	0 heavy	1 medium	2 mild (sheep)	3 none	

GROUND COVER									
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES				
Mulgara	YES	NO	DETAILS	Suitable habitat with sandy soil and within distribution but no signs
Bilby	YES	NO		Outside of species distribution
Quoll	YES	NO		
Pebble Mouse	YES	NO		

Birds	Mammals	Reptiles
Zebra Finch		
Willie Wagtail		
Budgies		

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL  
(North West)**

Location: Exmouth - Subsea 7 Habitat Assessment: 5

Project: 2198

Date: 13/06/2017	Easting: 203600	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7534250		E	S	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation Description	Dune swale	Other:	Vegetation Species	Average Height (m)	Cover					
	Acacia Shrubland	Stratum			Scattered Plants	Sparse	Moderate	Thick		
	Riverine Woodland	Overstorey			Acacia sp.	2	<5%	1 <20%	2 20-60%	3 60-100%
Other Grassland	Midstorey	Acacia sp.	1	<5%	1 <20%	2 20-60%	3 60-100%			
Euc. Woodland	Ground Cover	Triodia	0.5	<5%	1 <20%	2 20-60%	3 60-100%			

**CONDITION**

**LAST FIRE**

Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	<1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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**General**

**DISTURBANCE**

**Cattle**

Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild (sheep)	3 none	
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**GROUND COVER**

	0	1	2	3	Hummock Grass	0	1	2	3
Bare Ground	<5%	<20%	20-60%	60-100%	<5%	<20%	20-60%	60-100%	
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	0 <5%	1 <20%	2 20-60%	3 60-100%	
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	0 <5%	1 <20%	2 20-60%	3 60-100%	
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	0 <5%	1 <20%	2 20-60%	3 60-100%	

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

**SPECIES**

Mulgara	YES	NO	DETAILS	Suitable habitat with sandy soil and within distribution but no signs
Bilby	YES	NO		Outside of species distribution
Quoll	YES	NO		
Pebble Mouse	YES	NO		

**Birds**

**Mammals**

**Reptiles**

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**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL  
(North West)**

Location: Exmouth - Subsea 7 Habitat Assessment: 6

Project: 2198

Date: 14/06/2017	Easting: 202958	<b>Aspect</b>	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7533162		E	SE	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Spinifex plain	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey			0	1	2	3		
	Other Grassland	Midstorey			<5%	<20%	20-60%	60-100%		
	Euc. Woodland	Ground Cover	Triodia		0	1	2	<b>3</b>		

CONDITION					LAST FIRE					
Scale:	5 Pristine	4 Excellent	<b>3</b> Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	<b>3</b> >5 Yr

General				DISTURBANCE				Cattle		
Tracks	0 heavy	1 medium *	<b>2</b> mild	3 none		0 heavy	1 medium	<b>2</b> mild (sheep)	3 none	

GROUND COVER									
Bare Ground	0 <5%	1 <20%	<b>2</b> 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	<b>3</b> 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	<b>3</b> Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Prescence	0 none	1 rare	2 moderate	3 common	
Suitability for Bats	YES			NO		Distance to Water	0 >5km	1 2-5km	2 500m - 2km	<b>3</b> <500m
Caves	Absent	Present			Termite Mounds	0 none	1 rare	2 moderate	3 common	
					Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	YES	NO	DETAILS
Bilby	YES	NO	
Quoll	YES	NO	
Pebble Mouse	YES	NO	

Suitable habitat with sandy soil and within distribution but no signs  
Outside of species distribution

Birds	Mammals	Reptiles
	Rabbit scats	Very old Varanid burrows
		(possibly <i>Gouldii</i> )
		<i>Ctenotus</i> sp.

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL  
(North West)**

Location: Exmouth - Subsea 7 Habitat Assessment: 7

Project: 2198

Date: 14/06/2017	Easting: 202592	<b>Aspect</b>	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7532587		E	SE	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation Description	Spinifex plain	Other:		Vegetation Species	Average Height (m)	Cover			
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick
	Riverine Woodland	Overstorey	Acacia sp.			2	0 <5%	1 <20%	2 20-60%
Other Grassland	Midstorey	Acacia sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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**General**

**DISTURBANCE**

**Cattle**

Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild (sheep and rabbit)	3 none	
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**GROUND COVER**

Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

**SPECIES**

Species	YES	NO	<b>DETAILS</b>	Notes
Mulgara	YES	NO		Suitable habitat with sandy soil and within distribution but no signs
Bilby	YES	NO		Outside of species distribution
Quoll	YES	NO		
Pebble Mouse	YES	NO		

Birds	Mammals	Reptiles
Pied Butcherbird	Rabbit scats	
	Kangaroo scats	

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**  
(North West)

Location: Exmouth - Subsea 7 Habitat Assessment: 8

Project: 2198

Date: 14/06/2017	Easting: 199375	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7527066		E	SE	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Spinifex plain	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.		2.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Other Grassland	Midstorey	Acacia sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

CONDITION					LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr

General				DISTURBANCE			Cattle			
Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild (sheep)	3 none	

GROUND COVER									
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	YES	NO	DETAILS
Bilby	YES	NO	
Quoll	YES	NO	
Pebble Mouse	YES	NO	
Suitable habitat with sandy soil and within distribution but no signs			
Outside of species distribution			

Birds	Mammals	Reptiles



**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**  
(North West)

Location: Exmouth - Subsea 7 Habitat Assessment: 9

Project: 2198

Date: 14/06/2017	Easting: 199300	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7527300		E	SE	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Spinifex plain	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.		2.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Other Grassland	Midstorey	Acacia sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

CONDITION					LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr

General				DISTURBANCE			Cattle			
Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild (sheep)	3 none	

GROUND COVER									
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	YES	NO	DETAILS
Bilby	YES	NO	
Quoll	YES	NO	
Pebble Mouse	YES	NO	

Birds	Mammals	Reptiles

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**  
(North West)

Location: Exmouth - Subsea 7 Habitat Assessment: 10

Project: 2198

Date: 15/06/2017	Easting: 198634	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7526316		E	SE	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Dune Ridge	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.		2.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5%	1 <20%	2 20-60%	3 60-100%	
	Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

CONDITION					LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr

General				DISTURBANCE			Cattle			
Telstra Track	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	

GROUND COVER									
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	YES	NO	DETAILS
Bilby	YES	NO	
Quoll	YES	NO	
Pebble Mouse	YES	NO	

Birds	Mammals	Reptiles
Brown Songlark		Ctenophorous burrows

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**  
(North West)

Location: Exmouth - Subsea 7 Habitat Assessment: 11

Project: 2198

Date: 15/06/2017	Easting: 198884	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 7526240		E	SE	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Dube swale	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.		2.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Other Grassland	Midstorey	Acacia sp.		1	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

CONDITION					LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr

General				DISTURBANCE			Cattle			
Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild rabbits	3 none	

GROUND COVER									
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	YES	NO	DETAILS
Bilby	YES	NO	
Quoll	YES	NO	
Pebble Mouse	YES	NO	

Birds	Mammals	Reptiles

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**  
(North West)

Location: Exmouth - Subsea 7 Habitat Assessment: 12

Project: 2198

Date: 15/06/2017	Easting: 199650	Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50	Northing: 752725		E	SE	W	N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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VEGETATION										
Vegetation Description	Dune Ridge	Other:		Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey	Acacia sp.		2.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
	Other Grassland	Midstorey	Acacia sp.			0 <5%	1 <20%	2 20-60%	3 60-100%	
	Euc Woodland	Ground Cover	Triodia		0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

CONDITION					LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr

General				DISTURBANCE			Cattle			
Telstra Track	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	

GROUND COVER									
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	<5%	<20%	20-60%	60-100%	Other Grass	<5%	<20%	20-60%	60-100%
Leaf Litter	<5%	<20%	20-60%	60-100%	Herbs	<5%	<20%	20-60%	60-100%
Logs >10cm	<5%	<20%	20-60%	60-100%	Other:	<5%	<20%	20-60%	60-100%

MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES				
Mulgara	YES	NO	DETAILS	Suitable habitat with sandy soil and within distribution but no signs
Bilby	YES	NO		Outside of species distribution
Quoll	YES	NO		
Pebble Mouse	YES	NO		

<b>Birds</b>	<b>Mammals</b>	<b>Reptiles</b>

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**  
(North West)

Location: Exmouth - Subsea 7

Habitat Assessment: 13

Project: 2198

Date: 16/06/2017

Easting: 201750

Aspect

N

NE

SW

NW

Quadrat Size: 50 x 50

Northing: 7531250

E

SE

W

N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation Description	Dube swale	Other:	Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum			Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey			Acacia sp.	2.5	0 <5%	1 <20%	2 20-60%
Other Grassland	Midstorey	Acacia sp.	1	0 <5%	1 <20%	2 20-60%	3 60-100%		
Euc Woodland	Ground Cover	Triodia	0.5	0 <5%	1 <20%	2 20-60%	3 60-100%		

**CONDITION**

**LAST FIRE**

Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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**General**

**DISTURBANCE**

**Cattle**

Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild rabbits	3 none	
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**GROUND COVER**

	0 <5%	1 <20%	2 20-60%	3 60-100%		0 <5%	1 <20%	2 20-60%	3 60-100%
Bare Ground					Hummock Grass				
Rock					Other Grass				
Leaf Litter					Herbs				
Logs >10cm					Other:				

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	<b>YES</b>	NO	DETAILS Suitable habitat with sandy soil and within distribution but no signs Outside of species distribution
Bilby	YES	<b>NO</b>	
Quoll	YES	<b>NO</b>	
Pebble Mouse	YES	<b>NO</b>	
<b>Birds</b>	<b>Mammals</b>		<b>Reptiles</b>

**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**

(North West)

Location: Exmouth - Subsea 7

Habitat Assessment: 14

Project: 2198

Date: 16/06/2017

Easting: 199650

Aspect

N

NE

SW

NW

Quadrat Size: 50 x 50

Northing: 752725

E

SE

W

N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation Description	Dune Ridge	Other:	Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum			Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey			Acacia sp.	2.5	0 <5%	1 <20%	2 20-60%
Other Grassland	Midstorey	Acacia sp.		0 <5%	1 <20%	2 20-60%	3 60-100%		
Euc Woodland	Ground Cover	Triodia		0 <5%	1 <20%	2 20-60%	3 60-100%		

**CONDITION**

**LAST FIRE**

Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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**General**

**DISTURBANCE**

**Cattle**

Track	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
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**GROUND COVER**

Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%	
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%	
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%	
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%	

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	<b>YES</b>	NO	DETAILS Suitable habitat with sandy soil and within distribution but no signs Outside of species distribution
Bilby	YES	<b>NO</b>	
Quoll	YES	<b>NO</b>	
Pebble Mouse	YES	<b>NO</b>	
<b>Birds</b>	<b>Mammals</b>		<b>Reptiles</b>



**FAUNA HABITAT ASSESSMENT SHEET - 360 ENVIRONMENTAL**

(North West)

Location: Exmouth - Subsea 7

Habitat Assessment: 15

Project: 2198

Date: 16/06/2017

Easting: 198884

Aspect

N

NE

SW

NW

Quadrat Size: 50 x 50

Northing: 7526240

E

SE

W

N/A



Soil Texture	(Red) sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation Description	Dube swale	Other:	Vegetation Species	Average Height (m)	Cover				
	Acacia Shrubland	Stratum			Scattered Plants	Sparse	Moderate	Thick	
	Riverine Woodland	Overstorey			Acacia sp.	2.5	0 <5%	1 <20%	2 20-60%
Other Grassland	Midstorey	Acacia sp.	1	0 <5%	1 <20%	2 20-60%	3 60-100%		
Euc Woodland	Ground Cover	Triodia	0.5	0 <5%	1 <20%	2 20-60%	3 60-100%		

**CONDITION**

**LAST FIRE**

Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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**General**

**DISTURBANCE**

**Cattle**

Tracks	0 heavy	1 medium *	2 mild	3 none		0 heavy	1 medium	2 mild rabbits	3 none	
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**GROUND COVER**

	0 <5%	1 <20%	2 20-60%	3 60-100%		0 <5%	1 <20%	2 20-60%	3 60-100%
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%	Other:	0 <5%	1 <20%	2 20-60%	3 60-100%

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Tree Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Tree Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES			NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	

SPECIES			
Mulgara	<b>YES</b>	NO	DETAILS Suitable habitat with sandy soil and within distribution but no signs Outside of species distribution
Bilby	YES	<b>NO</b>	
Quoll	YES	<b>NO</b>	
Pebble Mouse	YES	<b>NO</b>	
<b>Birds</b>	<b>Mammals</b>		<b>Reptiles</b>



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