PERDAMAN INDUSTRIES

CHEMICALS & FERTILISERS

Fauna Management Plan

Perdaman Urea Project

Burrup Peninsula, Western Australia

CW1055600

Prepared for Proponent:

Perdaman Chemicals and Fertilisers Pty Ltd

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Date: 19 March 2020

Assessment No:

2184 (WA)

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Summary

Proposal Title	Perdaman Urea Project
Proponent name	Perdaman Chemicals and Fertilisers Pty Ltd.
Assessment Number	2184 (WA) & 2018/8383 (Commonwealth)
Purpose of the FaMP	The purpose of this FaMP plan is to provide a framework which describes how the project will address, manage, monitor and mitigate impacts on native fauna. This plan supplements the CW1055600-EN-PL-001 Project Environmental Management Plan (PEMP) and Sub-Plans CW1055600-EN-PL-005 Threatened Species Management Plan (TSMP) and CW1055600-EN-PL-007 Flora Management Plan (FMP). The FaMP has the following objectives: • Minimise clearing and other environmental impacts on fauna habitat; • Measures to be implemented to protect fauna for life of Project; • Provide No-Go Zone fencing to control access to protected fauna habitat; • Signage requirements for the protection of habitat; and • Document the Project's responsibility, reporting and compliance guidelines.
Key environmental factors and objectives	The key environmental factors and objectives relevant to the Project include: ▪ Coastal processes - To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected. ▪ Marine environmental quality - To maintain the quality of water, sediment and biota so that environmental values are protected. ▪ Marine fauna - To protect marine fauna so that biological diversity and ecological integrity are maintained. ▪ Flora and vegetation - To protect flora and vegetation so that biological diversity and ecological integrity are maintained. ▪ Terrestrial fauna - To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. Ecological integrity is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements. ▪ Inland waters - To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Condition clauses	To be determined.
Key provisions in the plan	The FaMP's key provisions are included in *Section 9 Mitigation and Management Measures.* This section details the outcome and management based actions, that will be applied for the life of the Project.

Foreword

This Fauna Management Plan (FaMP) is a sub-plan of the overarching Project Environmental Management Plan (PEMP) for the Perdaman Urea Project. An overview of the structure of the PEMP and sub-plans is illustrated in Figure 0-1.

This plan shall be reviewed and updated as necessary throughout the construction, operation and decommissioning phases of the project. The review process is detailed in *Section 15 Review and Continual Improvement* of the PEMP.

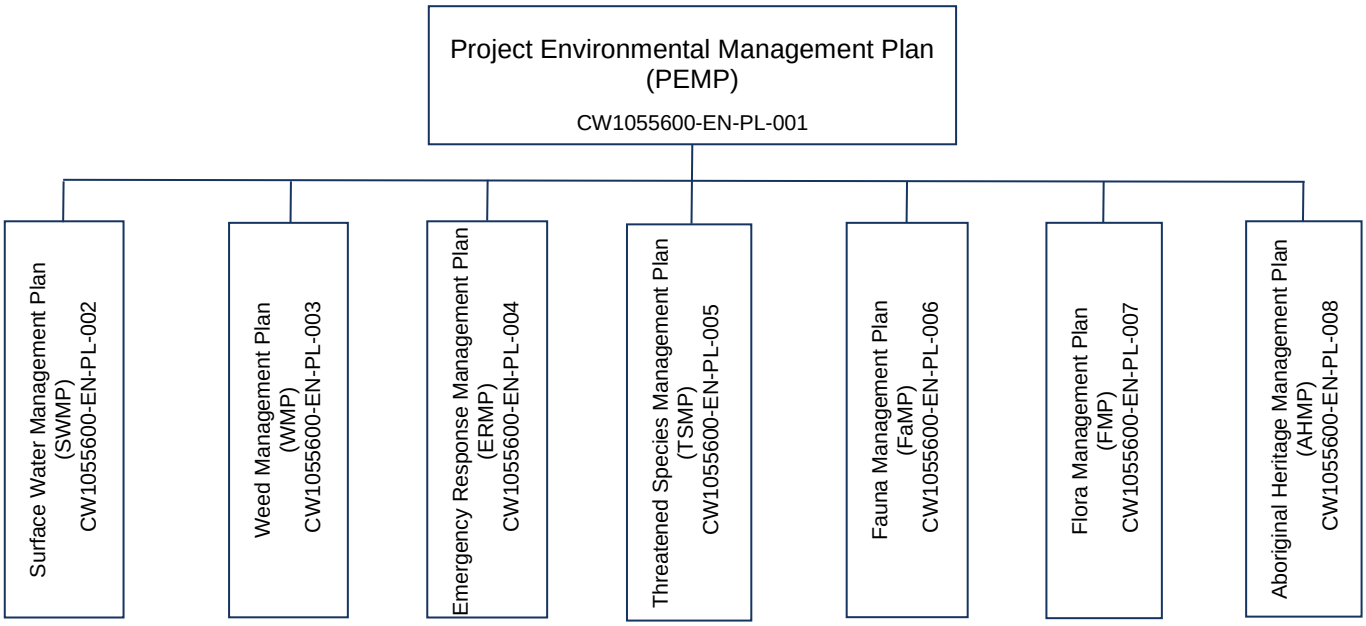

Figure 0-1: Structure of the Project Environmental Management Plan and supporting sub-plans.

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1 Introduction

Perdaman Chemicals and Fertilisers Pty Ltd (Perdaman) proposes to establish a state-of-the-art urea production plant within the Burrup Strategic Industrial Area (BSIA). The site is situated approximately 8 km from Dampier and 20 km north-west of Karratha on the north-west coast of Western Australia.

The key elements of the Project include the design, engineering, construction and operation of the main urea production facility, administration, maintenance and storage infrastructure, conveyor and port storage and shiploading facilities.

The main potential fauna impacts on the Project include the loss of fauna habitat as a result of vegetation clearing, injury or death caused by vehicle strike, introduced predators, anthropogenic activities (such as lighting, noise and vibration) and entrapment or accidental poisoning at the project site. A suite of strategies will be implemented throughout the construction and operational phases of the project to minimise or abate these impacts. These strategies are the provisions which form the Fauna Management Plan's (FMP) legal requirements to be adhered to across the Project.

This Fauna Management Plan (FaMP) provides the requirements for protecting all fauna, with the exclusion of threatened species, so that biological diversity and ecological integrity are maintained throughout the Project's construction and operational phases. Terrestrial and marine fauna threatened species are addressed separately in the Project's CW1055600-EN-PL-005 Threatened Species Management Plan (TSMP).

1.1 Purpose

The purpose of this FaMP plan is to provide a framework which describes how the project will address, manage, monitor and mitigate impacts on native fauna. This plan supplements the CW1055600-EN-PL-001 Project Environmental Management Plan (PEMP) and Sub-Plans: CW1055600-EN-PL-005 Threatened Species Management Plan (TSMP) and CW1055600-EN-PL-007 Flora Management Plan (FMP).

The FaMP has the following objectives:

- Minimise clearing and other environmental impacts on fauna habitat;
- Measures to be implemented to protect fauna for life of Project;
- Provide No-Go Zone fencing to control access to protected fauna habitat;
- Signage requirements for the protection of habitat; and
- Document the Project's responsibility, reporting and compliance guidelines.

The FaMP is to be read in conjunction with CW1055600-EN-PL-001 Project Environmental Management Plan (PEMP). Should there be a contradiction in specific requirements, this FaMP will take precedence.

1.2 Scope

The FaMP applies to all sites during the construction and operational phases of the Project. This includes, but is not limited to, Site C, Site F, the causeway, the conveyor corridor, Port side storage, transfer and ship loading facilities.

This document incorporates sound industry best practice and current (at the time of this revision) environmental approval conditions and proponent commitments made during the environmental approvals process.

The scope of this FaMP does not include the construction of port facilities such as the wharf or any infill that may be required of the coastal area for the provision of a wharf. These works are to be managed by the Pilbara Port Authority (PPA) under separate approval and management systems.

The management requirements for threatened species are addressed specifically in the TSMP. Should there be any contraction in threatened species-specific requirements between the FaMP and the TSMP, then the TSMP shall take precedence.

1.3 Responsibility

The responsibility for fauna management sits primarily with Perdaman which will ensure compliance with this FaMP and the PEMP.

It is the responsibility of all Project Personnel to understand their scope of works and how their activities could impact on fauna management.

2 Project Overview

Perdaman plans to construct and operate a state-of-the-art urea plant with a production capacity of approximately 2 million tonnes per annum (Mtpa) on the Burrup Peninsula in the North West of Australia (Figure 2-1) (the Project).

The Project infrastructure including the main production facility (urea plant), administration, maintenance and storage infrastructure, conveyor and port storage and shiploading facilities are situated within the Burrup Strategic Industrial Area (Burrup SIA). The estate's close proximity to gas, port and other key infrastructure makes it an ideal location for the Project.

The Burrup SIA is located in close proximity to the Murujuga National Park which covers an area of 4,913ha on the Burrup Peninsula. The area is considered to host the largest concentration of ancient rock art in the world. As such, the Project will apply effective management strategies that minimise or abate, actual or potential impacts on the environment, heritage and cultural values of the region.

The Project involves piping natural gas from the nearby Woodside operated LNG facility to the project site under a long term commercial off-take agreement. Natural gas is converted to urea and the final granulated product is transported by conveyor to the Dampier Port by closed conveyor along the East West Service route, where new facilities will include an enclosed stockpile shed and ship loading facilities.

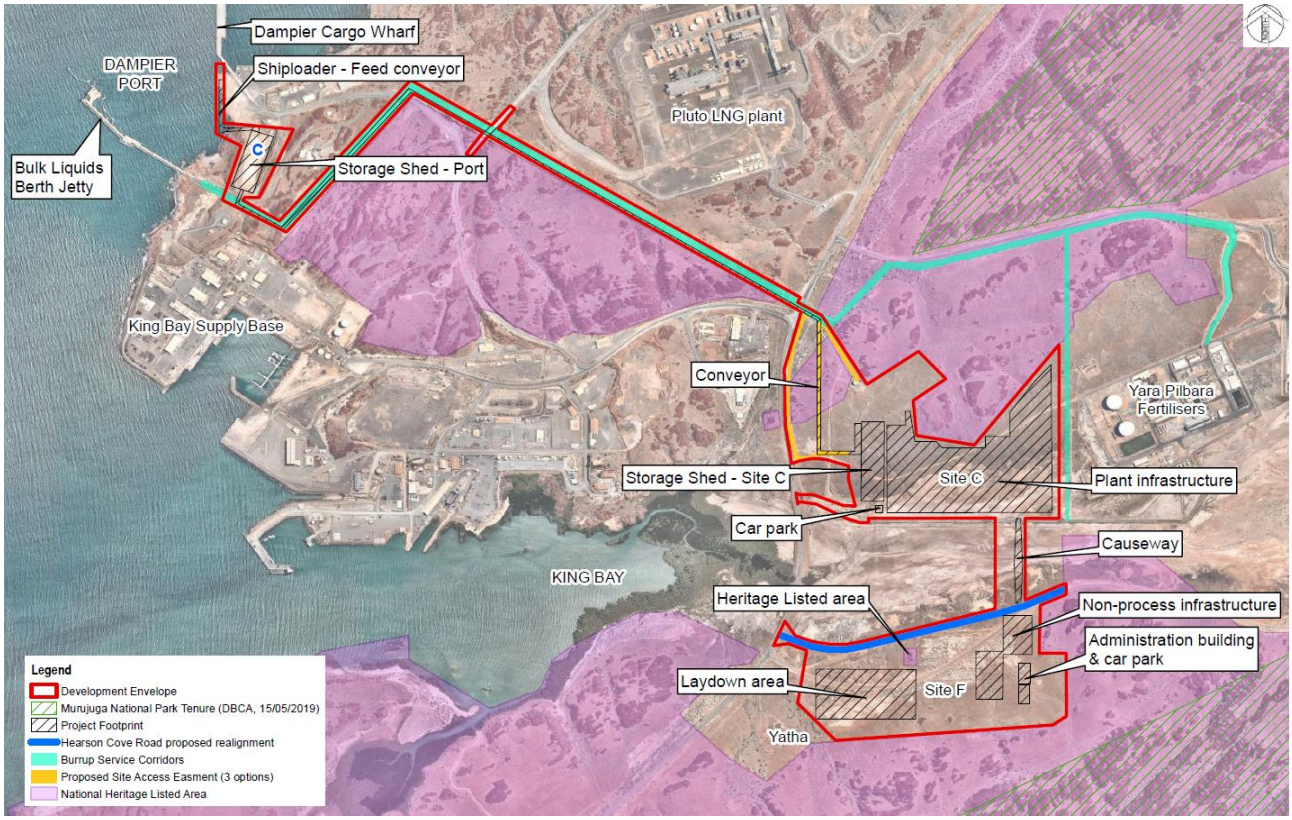

Figure 2-1 Project site layout and adjoining facilities.

Proven Urea production technology underpins each of the key stages of this project. The technologies being applied to the plant are equivalent to the industry best for the specific applications and successfully operate elsewhere in the world. The processing plant can be broadly considered in four sections, or Blocks, namely:

- Gas Block
- Product Block
- Utility Block
- Infrastructure and Logistics

Each of the Process Blocks is made up of a number of process units or physical sections of the plant. The major process sections are described in Figure 2-2.

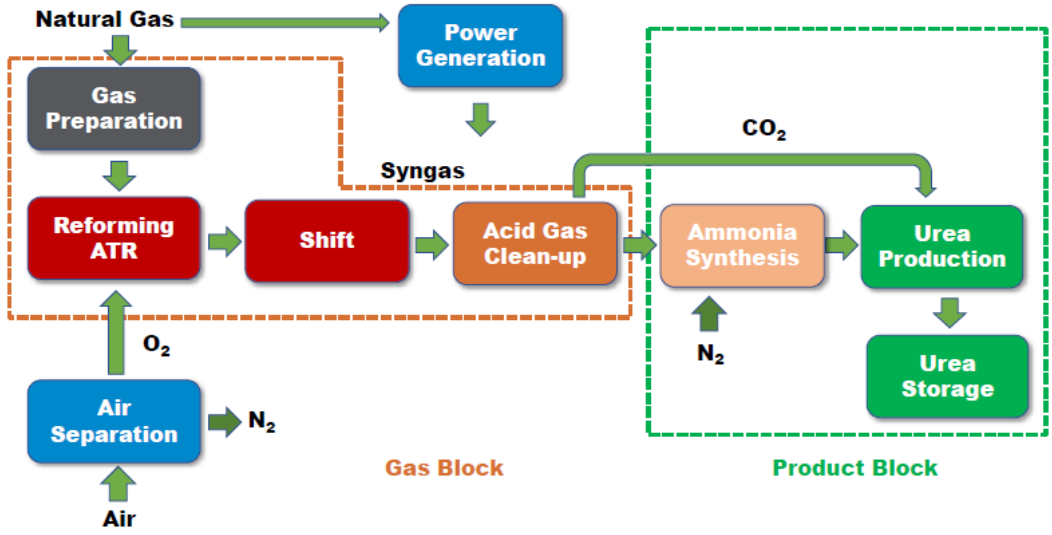

Figure 2-2 Figure 2-1: Process Block Diagram

3 Legislation, Commitments and Other Legal Requirements

3.1 Regulatory Obligations

Legislation relevant to fauna management on the Project includes, but is not limited to:

- Biodiversity Conservation Act 2016
- Biosecurity Act 2015
- Environment Protection and Biodiversity Conservation Act 1999
- Environmental Protection Act 1996
- Environmental Protection Regulations 1987
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004
- Environmental Protection (Noise) Regulations 1997
- Environmental Protection (Unauthorised Discharge) Regulations 1997

In addition to the above legislation, this management plan will be developed and regularly reviewed to comply with the commitments and legal obligations arising from the Project's environmental approvals process.

3.2 Project Approvals

The Project must comply with all of the conditions included in its granted approvals. Perdaman will be responsible for ensuring all statutory approvals required for activities or infrastructure specific to Project needs are attained in a timely manner.

Table 3-1 below includes indicative licenses and approvals potentially required for the Project, which may apply or contain conditions specifically related to fauna management. This list is provided as a guide only, and is subject to change throughout the life of the Project.

A detailed approval register will be maintained by Perdaman to monitor the implementation and progress of conditions, and the achievement, renewal and surrender of all licenses throughout the life of the Project.

Table 3-1 Project statutory approvals and agreements relevant to fauna management.

Approval / Agreement	Purpose	Agency / Jurisdiction
EP Act 1986 - Part IV Approval - Ministerial Statement	EPA assessment of strategic proposal.	EPA
Environmental Protection and Biodiversity Conservation Act 1999 – s.18 & 18A listed threatened species	Meeting Commonwealth requirements for threatened species.	DOEE
EP Act 1986 - Part V - Works Approval & Licence - Cat 54A or 85B. Desalination plant	For construction and operation of desalination plant.	DWER
EP Act 1986 - Part V - Works Approval & Licence - Cat 73. Chemical storage	For construction and operation of bulk storage of chemicals.	DWER
EP Act 1986 - Part V - Works Approval & Licence - Cat. 54 or 85 Sewage facility	For construction and operation of sewage facility with discharge to land or waters.	DWER
EP Act 1986 - Part V - Works Approval & Licence - Cat 58 or 86. Material loading.	For construction and operation of bulk material loading onto vessels by material loading system.	DWER
Biodiversity Conservation Act 2016 - Fauna Taking (Relocation) Licence	Fauna relocation associated with trenching operations.	DBCA

3.3 Fauna Taking (Relocation) License

In compliance with the Biodiversity Conservation Act 2016, Perdaman will have on site an appropriately qualified individual that holds a Fauna Taking (Relocation) Licence to take or disturb fauna for the purpose of relocating.

This includes during normal plant operations and Project construction. Relocation of fauna may be required as part of any clearing or grubbing works, and where fauna could enter a work area / trench and need to be safely removed and relocated to a suitable location outside the Project's battery limits.

3.4 Ground Disturbance Permits

A Ground Disturbance Permit (GDP) is a permit issued by Perdaman for enabling works within defined battery limits, which have the potential to impact native vegetation, fauna, heritage or other environmentally sensitive values.

The GDP provides the Project personnel responsible for managing the ground disturbing activities with a summary of the key approval commitments and obligations obtained by or issued to Perdaman by regulators, tenure holders and other third parties.

Activities covered in the GDP include but are not limited to clearing and grubbing, grading open ground, movement of plant, equipment and vehicles and any other activity which will disturb or damage soil, waterways, habitat and, or vegetation.

A GDP could be issued through a standalone process or included in an overall approval to work procedure developed for the Project.

It is the responsibility of all project Personnel to ensure they submit to Perdaman an application form requesting a GDP at least two weeks prior to requiring access to the area being the subject of the GDP.

4 Conservation Significant Fauna

4.1 Survey and Study findings

As part of the Project's environmental assessment process, Animal Plant Mineral (APM) was engaged to undertake:

- Desktop fauna studies of the Study Area; and
- Multi-season terrestrial vertebrate fauna surveys of the Study Area.

The post-wet season field surveys followed the passage of Cyclone Veronica which crossed Karratha in March 2019. The Karratha Aero weather station (BOM station 00408310, 10 km to the south of the Survey Area) recorded 70 mm of rainfall associated with the passage of the cyclone. This rainfall created sufficient post-wet season survey conditions.

Two fauna surveys were conducted at the Project Area; an initial level 1 fauna survey prior to the wet season of 2018 / 2019 and a level 2 survey conducted immediately after that wet season. A full bird census, camera trapping, spotlight surveys, and bat surveys were carried out in both surveys, while a full terrestrial fauna trapping survey was conducted in the post-wet season survey. Four broad fauna habitats are present within the Project Area; rocky outcrops, hummock grasslands on mid-slopes, drainage lines, and samphire shrublands and supra-tidal flats. A range of migratory shorebirds and waders were observed including the Red-capped Plover (*Charadrius ruficapillus*), Grey-tailed Tattler (*Tringa brevipes*), and the Common Greenshank (*Tringa nebularia*). However, no Threatened bird species were recorded during the survey. Supra-tidal flats within the Project Area and mangrove vegetation surrounding King Bay to the west provide locally important habitat for a range of species, especially waders and shorebirds. The Project, however, will avoid direct disturbance of this habitat type. In addition, the proposed causeway that crosses the supra-tidal flats will be designed with culverts to avoid alteration of surface water flows, mitigating potential indirect impacts to downstream habitats.

The Ghost Bat (*Macroderma gigas*) was recorded using acoustic bat detectors on two occasions during the post wet season survey. It is listed as Vulnerable under both Federal and State legislation. However, no roost sites were identified during the surveys, indicating that the bats roost nearby (possibly at Murujuga National Park to the south), and forage over the Project Area. The drainage line in the south-west of the Project Area provides suitable foraging habitat for this species. Disturbance of this area will be avoided.

Rocky outcrops present at the northern and southern fringes of the Project Area were searched for the Northern Quoll (*Dasyurus hallucatus*) and the Pilbara Olive Python (*Lialis olivaceus barroni*). While neither of these species was recorded during the survey, both are highly cryptic, and may occur within the Project Area. Disturbance of rocky outcrops will therefore be minimised.

The full report of the fauna assessment in, *Perdaman Urea Project – Pre and Post-wet Season Biological Survey* (APM, 2019) is included in Attachment A.

Table 4.1 provides a list of the conservation significant fauna species identified during the fauna assessment. It includes species identified across all database searches and relevant biological surveys in the vicinity of the Project area. Though it includes threatened species, the Project's impacts and mitigations on these species are addressed in greater detail in CW1055600-EN-PL-005 Threatened Species Management Plan.

Table 4-1: Conservation significant fauna identified in the Project area.

Species	Common Name	Cons. Code		Database			Biological Surveys		
		Cth	State	NatureMap 10km buffer	AoLA 10km buffer	DBCA ~25km buffer	EPBC 5km buffer	Worley Astron 2006	APM
Birds									
Accipiter fasciatus	Brown Goshawk	M[1]	-					x	x
Acrocephalus australis	Australian Reed Warbler	M	-		x				
Actitis hypoleucos	Common Sandpiper	IA[2], M	IA	x	x	x	x	x	
Anous stolidus	Common Noddy	IA, M	IA	x	x	x	x		
Anthus novaeseelandiae	Australasian pipit	M	-		x			x	x
Apus pacificus	Fork-tailed Swift	IA, M	IA			x	x	x	
Ardea alba	Great Egret	M	-				x	x	
Ardea ibis	Cattle Egret	M	-				x		
Ardenna pacifica	Wedge-tailed Shearwater	IA, M	IA					x	
Arenaria interpres	Ruddy Turnstone	IA	IA	x	x	x		x	
Cacomantis pallidus	Pallid Cuckoo	M	-	x	x			x	x
Calidris acuminata	Sharp-Tailed Sandpiper	IA, M	IA		x	x	x	x	
Calidris alba	Sanderling	IA, M	IA			x		x	
Calidris canutus	Red Knot	EN, IA, M	EN			x	x	x	
Calidris ferruginea	Curlew Sandpiper	CR, IA, M	CR			x	x	x	
Calidris melanotos	Pectoral Sandpiper	IA, M	-				x		
Calidris ruficollis	Red-necked stint	IA, M	IA			x		x	x

Species	Common Name	Cons. Code		Database			Biological Surveys		
		Cth	State	NatureMap 10km buffer	AoLA 10km buffer	DBCA ~25km buffer	EPBC 5km buffer	Worley Astron 2006	APM
Calidris subminuta	Long-toed Stint	IA, M	IA					x	
Calidris tenuirostris	Great knot	CR, IA, M	CR					x	
Calonectris leucomelas	Streaked Shearwater	IA, M	IA				x		
Chalcites osculans	Black-eared Cuckoo	M	-				x	x	x
Charadrius leschenaultii	Greater Sand Plover	VU, IA	VU, IA	x		x		x	
Charadrius mongolus	Lesser Sand Plover	EN, IA	EN, IA			x		x	
Charadrius ruficapillus	Red-capped Plover	M	-	x	x			x	x
Charadrius veredus	Oriental plover	IA, M	IA			x	x		
Chlidonias hybrida	Whiskered tern	M	-					x	x
Chlidonias leucopterus	White-winged Black Tern	IA, M	IA					x	
Chroicocephalus novaehollandiae	Silver Gull	M	-	x	x			x	x
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo	M	-		x			x	
Circus approximans	Swamp harrier	M	-					x	
Coracina novaehollandiae	Black-faced Cuckoo-shrike	M	-	x	x			x	x
Egretta garzetta	Little Egret	M	-		x			x	x
Egretta sacra	Eastern Reef Egret	M	-		x			x	
Esacus Mgnirostris	Beach Stone-Curlew	M	-	x	x			x	
Eurostopodus argus	Spotted nightjar	M	-					x	
Falco cenchroides	Nankeen Kestrel	M	-	x	x			x	x
Falco peregrinus	Peregrine Falcon	-	OS	x	x	x			
Fregata ariel	Lesser Frigatebird	IA, M	IA		x	x	x	x	
Gelochelidon nilotica	Gull-Billed Tern	IA	IA	x	x			x	
Glareola Mldivarum	Oriental pratincole	IA, M	IA				x		
Grallina cyanoleuca	Magpie-lark	M	-	x	x			x	x
Haliaeetus leucogaster	White-bellied Sea-Eagle	M	-	x	x		x	x	x

Species	Common Name	Cons. Code		Database			Biological Surveys		
		Cth	State	NaturMap 10km buffer	AoLA 10km buffer	DBCA ~25km buffer	EPBC 5km buffer	Worley Astron 2006	APM
Haliastur indus	Brahminy Kite	M	-	x	x			x	x
Haliastur sphenurus	Whistling Kite	M	-	x	x			x	x
Himantopus himamtopus	Black-winged Stilt	M	-					x	x
Hirundo neoxena	Welcome Swallow	M	-	x	x			x	x
Hirundo rustica	Barn swallow	IA, M	IA				x		
Hydroprogne caspia	Caspian Tern	IA	IA		x	x		x	x
Limicola falcinellus	Broad-billed Sandpiper	IA, M	-					x	
Limosa lapponica	Bar-tailed Godwit	IA, M	IA				x		
Limosa lapponica baueri	Bar-tailed Godwit	VU, IA	VU, IA	x	x	x	x	x	
Limosa lapponica menzbieri	Northern Siberian Bar- tailed Godwit	CR, IA, M	CR, IA, M				x		
Limosa limosa	Black-tailed Godwit	IA	IA			x		x	
Macronectes giganteus	Southern Giant-Petrel	EN, IA, M	IA				x		
Merops ornatus	Rainbow Bee-eater	M	-	x	x		x		x
Motacilla cinerea	Grey Wagtail	IA, M	IA				x		
Motacilla flava	Yellow Wagtail	IA, M	IA				x		
Ninox novaeseelandiae	Southern boobook	M	-					x	
Numenius minutus	Little Whimbrel	CR, IA, M	IA		x	x			
Numenius madagascariensis	Eastern Curlew	IA	CR	x	x	x	x	x	
Numenius phaeopus	Whimbrel	IA	IA	x	x	x		x	x
Nycticorax caledonicus	Nankeen night heron	M	-					x	
Oceanites oceanicus	Wilson's storm-petrel	IA	IA			x			
Onychoprion anaethetus	Bridled Tern	IA	IA				x		
Pandion cristatus	Eastern Osprey	IA, M	IA	x	x	x		x	x
Pelecanus conspicillatus	Australian pelican	M	-					x	
Petrochelidon nigricans	Tree Martin	M	-	x	x			x	x

Species	Common Name	Cons. Code		Database			Biological Surveys		
		Cth	State	NaturMap 10km buffer	AoLA 10km buffer	DBCA ~25km buffer	EPBC 5km buffer	Worley Astron 2006	APM
Pezoporus occidentalis	Night Parrot	EN	CR				x		
Phalaropus lobatus	Red-necked Phalarope	IA, M	-					x	
Pluvialis fulva	Pacific golden plover	IA, M	IA						x
Pluvialis squatarola	Grey plover	IA	IA			x		x	
Recurvirostra novaehollandiae	Red-necked Avocet	M	-					x	
Rostratula australis	Australian Painted-Snipe	EN	EN				x		
Sterna dougallii	Roseate Tern	IA, M	IA		x	x		x	
Sterna hirundo	Common Tern	IA	IA			x		x	
Sternula albifrons	little tern	IA	IA			x			
Sternula nereis nereis	Australian Fairy tern	VU	VU			x	x	x	
Stiltia isabella	Australian pratincole	M	-					x	
Sula leucogaster	Brown Booby	IA	IA		x	x		x	
Thalasseus bengalensis	Lesser Crested Tern	M	-	x	x			x	x
Thalasseus bergii	Crested Tern	IA	IA	x	x	x		x	
Todiramphus sanctus	Sacred Kingfisher	M	-	x	x			x	
Tringa brevipes	Grey-tailed Tattler	IA	IA, P4	x	x	x		x	x
Tringa glareola	wood sandpiper	IA	IA			x			
Tringa nebularia	Common Greenshank	IA, M	IA	x	x	x	x	x	x
Tringa stagnatilis	marsh sandpiper, little greenshank	IA	IA			x		x	
Tringa totanus	Common Redshank	IA, M	IA		x				
Xenus cinereus	Terek sandpiper	IA	IA			x		x	
Reptile									
Ctenotus angusticeps	Northwestern Coastal Ctenotus	VU	P3				x		
Liasis olivaceus subsp. barroni	Pilbara Olive Python	VU	VU	x		x	x		

Species	Common Name	Cons. Code		Database				Biological Surveys	
		Cth	State	NatureMap 10km buffer	AoLA 10km buffer	DBCA ~25km buffer	EPBC 5km buffer	Worley Astron 2006	APM
Notoscincus butleri	Lined-soil Crevice Skink (Dampier)	-	P4					x	
Mammal									
Dasyurus hallucatus	Northern Quoll	EN	EN	x		x	x	x	
Hydromys chrysogaster	Water-rat	-	P4			x		x	
Macroderma gigas	Ghost Bat	VU	VU	x		x	x		x
Macrotis lagotis	Greater Bilby	VU	VU				x		
Mormopterus cobourgianus	Northern Coastal Free- tailed Bat	-	P1	x		x		x	x
Petrogale lateralis	Rock-wallaby	EN	-					x	
Pseudomys chapmani	Western Pebble-mound Mouse	-	P4	x		x			
Rhinonicteris aurantia	Pilbara Leaf-Nosed Bat	VU	P4				x		

4.2 Birds

APM recorded 63 bird species across the pre-wet and post-wet season surveys (Table 4-1). In total, 150 bird species have been recorded on the Burrup Peninsula in surveys conducted in 1994, 1998, 2002, 2005 Worley Astron, 2006) and the two surveys by APM. Six of the species recorded by APM were not recorded in previous surveys or database searches including the migratory species, the Pacific Golden Plover (Pluvialis fulva).

While survey timing was appropriate to target migratory species, late 2018 and early 2019 was an unseasonably dry period on the Burrup Peninsula. In the week leading up the March 2019 survey, a large cyclone in the region resulted in a moderate rainfall event (71 mm total). As such, the March survey represented a time where total seasonal rainfall was below average, but the recent cyclonic rainfall in March alone was above average. In addition, the recent rainfall had resulted in areas of available surface water on the floodplain areas (often due to raised earthworks for infrastructure stopping drainage). The availability of fresh water is likely to have increased the use of the site by migratory waders and shorebirds, therefore increasing the probability of being recorded during surveys.

Seven of the species recorded during APM surveys are listed as Migratory; the Caspian Tern *(Hydroprogne caspia)*, Whimbrel *(Numenius phaeopus)*, Grey-tailed Tattler *(Tringa brevipes)*, which is also listed as Priority 4 at the state level, Red-necked Stint *(Calidris ruficollis)*, Eastern Osprey *(Pandion haliaetus)*, Pacific Golden Plover *(Pluvialis fulva)*, and the Common Greenshank *(Tringa nebularia)*.

The avifauna records from APM's surveys, and the associated habitat types these records were made within the Project area, are listed in Table 4-1.

Table 4-1 Avifauna survey records and associated habitat types within the Project area.

Order	Family	Species	Common Name	Mid-slope	Rocky Outcrop	Samphire
ANSERIFORMES	Anatidae	*Anas gracilis*	Grey Teal		x	x
CHARADRIIFORMES	Charadriidae	*Charadruis ruficapillus*	Red-capped Plover	x	x	x
		Pluvialis fulva	Pacific Golden Plover			x
CHARADRIIFORMES	Laridae	*Chlidonias hybrida*	Whiskered Tern	x	x	x
		Chroicocephalus novaehollandiae	Silver Gull			x
		Hydroprogne caspia	Caspian Tern			x
		Thalasseus bengalensis	Lesser Crested Tern		x	
	Recurvirostridae	*Himantopus leucocephalus*	Pied Stilt		x	x
	Scolopacidae	*Calidris ruficollis*	Red-Necked Stint			x
		Numenius phaeopus	Whimbrel			x
		Tringa brevipes	Grey-tailed Tattler		x	x
		Tringa nebularia	Common Greenshank	x	x	x
CICONIIFORMES	Ardeidae	*Egretta garzetta*	Little Egret	x	x	x
		Egretta novaehollandiae	White-faced Heron			x
COLUMBIFORMES	Columbidae	*Geopelia cuneata*	Diamond Dove	x	x	
		Geopelia placida	Peaceful Dove	x		x
		Geophaps plumifera	Spinifex Pigeon	x	x	x
		Ocyphaps lophotes	Crested Pigeon	x	x	x
CORACIIFORMES	Alcedinidae	*Todiramphus pyrrhopygius*	Red-Backed Kingfisher	x	x	x
	Meropidae	*Merops ornatus*	Rainbow Bee-eater	x		
CUCULIFORMES	Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo	x	x	
		Chalcites osculans	Black-Eared Cuckoo	x	x	
FALCONIFORMES	Accipitridae	*Accipiter fasciatus*	Brown Goshawk	x		
		Aquila audax	Wedge-Tailed Eagle	x		
		Circus assimilis	Spotted Harrier	x		x
		Elanus axillaris	Black-shouldered Kite	x	x	x
		Haliaeetus leucogaster	White-bellied Sea-Eagle		x	
		Haliastur indus	Brahminy Kite	x		x
		Haliastur sphenurus	Whistling Kite	x	x	x

Order	Family	Species	Common Name	Mid-slope	Rocky Outcrop	Samphire
		Pandion haliaetus	Eastern Osprey		x	
	Falconidae	*Falco berigora*	Brown Falcon	x	x	x
		Falco cenchroides	Nankeen Kestrel	x	x	x
		Milvus migrans	Black Kite		x	
GALLIFORMES	Phasianidae	*Coturnix ypsilophora*	Swamp Quail	x		
PASSERIFORMES	Acanthizidae	*Smicrornis brevirostris*	Weebill	x	x	
	Alaudidae	*Mirafra javanica*	Horsfield's Bushlark	x		
	Artamidae	*Artamus cinereus*	Black-faced Woodswallow	x	x	x
		Cracticus nigrogularis	Pied Butcherbird	x	x	x
	Campephagidae	*Coracina papuensis*	White-bellied Cuckooshrike	x	x	x
		Lalage tricolor	White-Winged Triller	x	x	
	Corvidae	*Corvus orru*	Torresian Crow	x	x	x
	Estrildidae	*Emblema pictum*	Painted Finch	x	x	x
		Neochmia ruficauda	Star Finch	x	x	
		Taeniopygia guttata	Zebra Finch	x	x	x
	Hirundininae	*Hirundo neoxena*	Welcome Swallow		x	x
		Petrochelidon ariel	Fairy Martin	x	x	
		Petrochelidon nigricans	Tree Martin			x
	Locustellidae	*Megalurus mathewsi*	Rufous Songlark	x	x	x
	Maluridae	*Malurus leucopterus*	White-Winged Fairy-wren	x		
	Meliphagidae	*Epthianura tricolor*	Crimson Chat	x	x	
		Gavicalis virescens	Singing Honeyeater	x	x	x
		Lichmera indistincta	Brown Honeyeater	x	x	x
		Manorina flavigula	Yellow-Throated Miner	x	x	x
		Ptilotula penicillata	White-Plumed Honeyeater	x	x	
	Monarchidae	*Grallina cyanoleuca*	Magpie-Lark		x	x
	Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit	x	x	x
	Pardalotidae	*Pardalotus rubricatus*	Red-Browed Pardalote	x		
		Pardalotus striatus	Striated Pardalote	x	x	
	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	x	x	x
PELECANIFORMES	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant			x
PSITTACIFORMES	Cacatuidae	*Cacatua sanguinea*	Little Corella	x	x	x

Order	Family	Species	Common Name	Mid-slope	Rocky Outcrop	Samphire
		Eolophus roseicapilla	Galah	x	x	x
	Psittacidae	*Melopsittacus undulatus*	Budgerigar		x	
	Total	**45**	**45**	**41**		

4.3 Reptiles

Twenty-eight species of reptiles and amphibians were recorded by APM, all of which were identified during the post wet-season trapping survey (Table 4-2). Despite the low diversity and density of amphibians on the Burrup Peninsula (likely due to the absence of permanent fresh water), the Mains Burrowing Frog *(Cyclorana maini)* was recorded eight times, all on only 2 nights at the beginning of the survey, just after a major rainfall event.

The reptile assemblage on the Burrup Peninsula is generally consistent with the nearby mainland. The most common species were the North-western Sandslider *(Lerista bipes)*, Rock Ctenotus *(Ctenotus saxatillis)*, Spotted Dtella *(Gehyra punctata)*, and Western Dwarf Skink *(Menetia surda)* (Table 4-2). Two of the species recorded by APM, the Pygmy spiny-tailed Skink *(Egernia depressa)* and Mitchell's Bearded Dragon *(Pogona minor mitchelli)*, have not been recorded in previous surveys (Worley Astron, 2006) and were not present in database searches of the Study Area. Worley Astron (2006) recoded 50 reptile and two amphibian species in surveys adjacent to the Study Area.

Spotlight surveys were conducted during both APM surveys in rocky outcrop areas in an effort to record the Pilbara Olive Python *(Lialis olivaceus barroni)*. However, this species was not sampled in either survey.

Table 4-2 The number of records of reptile species during the 2019 APM survey, including the type of record and the number of records across each habitat type.

Scientific name	Common Name	Record Type					Habitat			
		Camera	Opp.	Elliot	Funnel	Pit	Mid-slope	Rocky Outcrop	Samphire	Total
Frog										
Cyclorana maini	Main's Frog				3	5	5	3		8
Gecko										
Gehyra punctata	Spotted Dtella		1		11		1	11		12
Strophorus elderi	Jewelled Gecko					1	1			1
Heteronotia binoei	Bynoe's Gecko				5			1	4	5
Skink										
Lerista bipes	North-Western Sandslider		1		10	26	21		16	37
Carlia tricantha	Desert rainbow-skink				2			2		2
Cryptoblepharus plagiocephalus	Péron's snake-eyed skink					1	1			1
Ctenotus leonhardii	Leonhards Ctenotus				5	2	5	1	1	7
Ctenotus rubicundus	Ruddy Ctenotus			1			1			1
Ctenotus saxatillis	Rock Ctenotus				44	6	12	23	15	50
Egernia depressa	Pygmy Spiny-tailed Monitor		2		1			1	2	3
Eremiascincus isolepis	Northern Bar-lipped Skink				1	2			3	3
Menetia surda	Western Dwarf Skink				5	4	2	2	5	9
Morethia ruficauda exquisita	Lined Firetail Skink		1		15	1	1	14	2	17
Pygopod										
Delma borea	Rusty-topped Delma				1		1			1
Delma pax	Peace Delma					1	1			1
Lialis burtonis	Burton's Legless Lizard				1	1	1		1	2
Dragon										
Ctenophorus caudicinctus	Ring-tailed Dragon				2	3	1		4	5
Ctenophorus isolepis isolepis	Central Military Dragon					1	1			1

Scientific name	Common Name	Record Type					Habitat			
		Camera	Opp.	Elliot	Funnel	Pit	Mid-slope	Rocky Outcrop	Samphire	Total
Lophognathus gilbertii	Gilbert's Dragon					1			1	1
Pogona minor mitchelli	Western Bearded Dragon				4	3	7			7
Varanid										
Varanus acanthurus	Spiny-tailed Monitor				3	1		2	2	4
Varanus panoptes	Yellow-spotted Monitor	1						1		1
Snake										
Anilios ammodytes	Sand-diving Blind Snake				1	2		2	1	3
Anilios grypus	Long-beaked Blind Snake				1	1	1	1		2
Antaresia perthensis	Pygmy Snake		7					5	2	7
Pseudechis australis	Mulga Snake		1		1			2		2
Pseudonaja mengdeni	Western Brown Snake		1		1		2			2

4.4 Mammals

APM recorded 15 mammal species over the two surveys (Table 4-3 and Table 4-4); 7 non-volant mammals and 8 bat species. The mammal assemblage at the site is typical of many areas in the Pilbara region, with Euros (*Osphranter robustus*) being the largest and most common species, while various small and medium sized mammals are also present, including the Short-Beaked Echidna (*T. aculeatus*), Delicate Mouse (*Psuedomys delicatulus*) and Desert Mouse (*P. desertor*). A range of naturalised (i.e. Dingo/dog, *Canis familiaris*) and introduced (i.e. Feral cat, *Felis catus*; Black rat, *Rattus rattus*), were also recorded.

Table 4-3 Records of Non-valant mammal species across two APM surveys

Scientific name	Common name	Record Type					Habitat		
		Camera	Scat	Cage	Elliot	Pit	Mid-slope	Rocky Outcrop	Samphire
Osphranter robustus	Euro	23					13	7	3
Pseudomys delicatulus	Delicate Mouse					1			1
Pseudomys desertor	Desert Mouse				1				1
Tachyglossus aculeatus	Echidna		1					1	
Canis familiaris	Dog/Dingo		1				1		
Felis catus	Cat	3	1	2			1	3	2
Rattus rattus	Black Rat	1						1	

In total, 21 non-volant mammals have been recorded on the Burrup Peninsula, inclusive of APM and other published report survey results (years 1994-2002) (Worley Astron, 2006). Many of these species, however, are likely to inhabit the unique and diverse rocky outcrops present throughout the region (NB: the total of 32 native mammal species noted in section 5.1 included records off the Burrup Peninsula but in similar habitat). The APM surveys targeted areas that were likely to be disturbed by the proposed construction, which are on the mid- slope and samphire areas. *Psuedomys desertor* was recorded in the 2019 APM survey, but had not been recorded in either database searches, or during the Worley Astron (2006) survey.

Targeted spot surveys were conducted, looking for the Northern Quoll *(Dasyurus hallucatus)*, Rock Wallaby *(Petrogale lateralis)*, and Rothschild's rock wallaby *(Petrogale rothschildi)*, in the rocky outcrops within, and immediately adjacent to, the Study Area. These species were not recorded during APM surveys, however, have been recorded in the broader area (Worley Astron, 2006). The Northern Quoll is discussed in a later section.

While Rothschild's rock wallaby *(Petrogale rothschildi)* is present on islands of the Dampier Archipelago, any mainland populations south of Withnell Bay are now rare or completely absent (Pearson & Eldridge, 2008). At sites in the northern parts of the Burrup Peninsula, rock wallaby populations are recovering in response to fox baiting operations. While foraging habitat is present in creeklines containing diverse grasses and shrubs, the absence of deep caves required by this species for diurnal shelter make it highly unlikely that this species will be present in the Study Area (Department of Parks and Wildlife, 2013). Plains of small-sized rocks may represent appropriate habitat for the Western pebble-mound mouse *(Pseudomys chapmani)*, however the species has not been recorded in the Study Area. Recent work has suggested that the species is only patchily distributed in the central and southern Pilbara (Western Wildlife, 2008). The outcrops within the Study Area are small and isolated, and likely to be less important than the larger outcrops to the south, which provide greater connectivity and opportunity for secure and productive habitat.

During the APM surveys, eight bat species were recorded on acoustic bat detectors, deployed throughout the Study Area (Table 4-3). The most common species, recorded on multiple occasions across all habitat types at the site, were the Northern Coastal Free-tailed Bat *(Mormopterus cobourgianus)*, Little Broad-nosed Bat *(Scotorepens greyii)*, Common Sheath-tailed Bat *(Taphozous georgianus)*, and Finlaysons's Cave Bat *(Vespadelus finlayson's)*. In addition, flying foxes *(Pteropus sp.)* have been observed in the mangroves to the west of the Study Area during the APM 2018 survey and in previous surveys (Worley Astron, 2006). The most frequent records were on detectors deployed in rocky outcrop habitats, suggesting that these areas, and the adjacent rockpiles, may provide important habitat for many bat species.

Table 4-4 Number of nights which bat species were recorded in each habitat.

Scientific name	Common name	Mid-slope	Rocky Outcrop	Samphire
Austronomus australis	White-striped Free-tailed Bat		1	1
Chaerephon jobensis	Greater Northern Free-tailed Bat		1	2
Chalinolobus gouldii	Gould's Wattled Bat			1
Macroderma gigas	Ghost Bat	1	1	
Mormopterus cobourgianus	Northern Coastal Free-tailed Bat	6	14	7
Scotorepens greyii	Little Broad-nosed Bat	8	21	8
Taphozous georgianus	Common Sheath-tailed Bat	13	23	8
Vespadelus finlaysoni	Finlayson's Cave Bat	8	18	8

During the 2019 APM survey, Ghost Bats *(Macroderma gigas)* were detected on two nights in rocky outcrop and mid-slope habitats (Table 4-4). The Ghost Bat, in addition to the White-striped Free-tailed Bat *(Austronomus australis)*, Greater Northern Free-tailed Bat *(Chaerephon jobensis)* and the Little Broad-nosed Bat *(S. greyii)* have not been recorded in database searches or previous surveys adjacent to the Study Area. This may reflect recent developments in sensitivity of technology used in modern bat detectors more than any lack of previous survey effort, or a shift in species occurrence.

4.5 Marine Turtles

Marine turtles are protected under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 and the Western Australian Wildlife Conservation Act 1950. Of the seven marine turtle species found globally, six are known to occur in the waters within the Dampier Archipelago.

These include:

- Green turtle *(Chelonia mydas)*

- Hawksbill turtle *(Eretmochelys imbricate)*
- Leatherback turtle *(Dermochelys coriacea)*
- Flatback turtle *(Natator depressus)*
- Loggerhead turtle *(Caretta caretta)*
- Olive ridley turtle *(Lepidochelys olivacea)*

A survey undertaken by Pendoley Environmental in 2006 determined that Holden Beach located approximately 1.5km northeast of the Project's Port area, did not support a major green or flatback sea turtle nesting rookery, though evidence of flatback turtles was recorded.

Light spill and other direct interference of the coastal rocky habitat is not expected to have any impact on protected sea turtles, given that there is such a low level of nesting activity within the bay north of this site, and that the bay present just southwest appears to be of poor habitat quality and too small to be of value to turtles. It is unlikely either flatback or green turtles are, or have been, using the bay adjacent to the Project area for nesting.

Other potential impacts on marine fauna will be limited to those associated with onshore activities, such as spills and sediment in runoff. Attachment B includes the marine fauna desktop assessment report completed for the Project.

5 Project Site Description

The Project is situated in the Burrup Strategic Industrial Area (BSIA) approximately 20km north-west of Karratha on the Burrup Peninsula in Western Australia. The BSIA has established industrial facilities including Yarra Pilbara Fertilisers and Nitrates plants and Woodside's Pluto LNG plant.

The Project area, including Sites C and F, the causeway, conveyor and Port storage and loading facilities, extends east-west approximately 3.4km covering about 105 hectares in area. As illustrated in figure 5-1, the Project area can be separated into five key areas:

Figure 5-1: Project General Arrangement

5.1 Site C

Site C is relatively undeveloped except for a few access tracks. The site is situated adjacent to the Yara Ammonia Plant to its east, to the north are steep rocky outcrops and to the south the saline coastal flat area. Drainage from the site flows in a southerly direction towards the saline coastal flat between Hearson Cove and King Bay.

Once developed Site C will include the main process plant and a 75,000 tonne urea storage shed.

5.2 Site F

Site F is situated to the south of Site C, on the opposite side of the saline coastal flat. It includes Hearson Cove Road and a significant proportion of previously disturbed area (now rehabilitated). Drainage from this area flows primarily north into the saline coastal flat.

During the construction phase of the Project, this area will be used as laydown for equipment and modules. The east portion of Site F will be developed to include the Perdaman Urea Plant's administration, maintenance, storage and warehousing facilities.

5.3 Causeway

The causeway, which links Sites C and F, extends across the saline coastal flat.

The causeway will be built up above the flat with regular hydrological and fauna friendly culverts to ensure the structure does not impede natural drainage, tidal action or the movement of wildlife.

5.4 Conveyor

The 3.2km conveyor will transport urea from the storage shed at Site C to the Port loading shed.

From Site C the conveyor will be constructed on relatively undisturbed land, to the west of the existing Water Corp pipeline corridor. It will extend north, connecting to the existing Burrup East West Services Corridor (EWSC).

The EWSC is a bitumen sealed corridor which already includes the Yara Pilbara Fertiliser's ammonia pipeline which extends to the bulk liquids jetty adjacent to the Project's Port facilities. The Project's conveyor will be positioned within this corridor and where possible use existing culverts to avoid roads and other infrastructure. Where the conveyor crosses Woodside's Haul Road the road will be built up to allow the conveyor to pass under.

5.5 Port Area

The Port Area includes a storage shed, covered conveyor and ship loader. The storage shed will be located within an existing highly disturbed quarry and the shiploader on a wharf which will be constructed by Pilbara Port Authority (PPA). The Conveyor will be situated on cleared area associated with the new wharf and existing quarry, and a small section of rocky ground between these two areas.

6 Fauna Habitat

6.1 Rocky Outcrops

Characteristic of the Burrup Peninsula, the formation of Proterozoic igneous rock outcrops (Gidley Granophyre) within the Project Area, weathered over time and resistant to extensive erosion, produce aggregates of split boulder screes. These formations create good cover for reptiles in the pockets for adequate shade and protection, and also caves for bats and other small terrestrial mammals. This habitat type is also suitable to the Pilbara Olive Python (*Liasis olivaceus barroni*), and though not recorded during the APM survey, it is highly likely this species may occur in the area due to the availability of suitable habitat.

Weathering has also created exposed granophyre bedrock, providing extensive plains of small-sized rocks, dominating the topsoil layer. While this may represent appropriate habitat for the Western pebble-mound mouse (*Pseudomys chapmani*), the species was not recorded in the Project Area and is likely now locally extinct, as it is currently only patchily distributed in the central and southern Pilbara. The outcrops within the Project Area are small and isolated, and likely to be less important than the larger outcrops to the south, which provide greater connectivity and opportunity for secure and productive habitat.

The Project Area may be occupied by the Rothschild's rock wallaby (*Petrogale rothschildi*), though records suggest the species exists on the islands of the Dampier Archipelago at low densities, and any populations south of Withnell Bay are now rare or completely absent. At sites in the northern parts of the Burrup Peninsula, rock wallaby recovered in response to fox baiting operations. The sub-species could use the rocky outcrops and creek lines nearby that contain diverse grasses and shrubs for foraging, though the species is not likely to be present as it requires deep caves for shelter during the heat of the day, and most of the rock piles are not significant enough to provide this. It is more likely the species would utilise rock piles on islands interspersed by areas of spinifex and soft grasses around beaches which are undisturbed by humans and enables them to venture short distances from their shelter sites to forage.

Evidence of Echidnas (*Tachyglossus aculeatus*) (scats found atop rockpiles) were located at the Project Area in reasonable quantities suggesting a persisting population on the Burrup Peninsula. The Finlayson's Cave Bat (*Vespadelus finlaysoni*) was recorded within this habitat type north west of the Project Area, close to the boundary. It was also recorded at the south eastern boundary of the Project Area, suggesting it was likely roosting somewhere in the extensive rocky outcrops adjacent the site, that spread east to south east and using the hummock grasslands for foraging. Similarly, the Little Broad-nosed Bat (*Scotorepens greyii*) was recorded in the same sites, which is unusual for this species, as it is not a cave-dweller. It is likely a reflection of the survey season, as the creek beds are dry and during this time, the species would switch to foraging within the grasslands, instead of the tree-lined and water-filled drainage lines you would expect during the wet.

6.2 Hummock Grasslands on Mid-Slopes

The Project Area and wider Burrup Peninsula contain coastal and subcoastal plains with mixed savannah hummock and tussock grasslands, and scattered shrubs of *Acacia pyrifolia* and *Acacia inaequilatera*. Upland areas are dominated by Triodia hummock-forming grasses which are present in the Project Area. A range of bird species are likely to use this grassy habitat for both foraging and nesting, especially given the proximity of the grassland to the ephemeral drainage lines. These include the Star Finch (*Neochmia subclarascens*), Swamp Quail (*Coturnix ypsilophora*), Painted Finch (*Emblema pictum*), and Crimson Chat (*Epthianura tricolor*).

This habitat type will also provide foraging habitat for grazers; primarily Euros (*Osphranter robustus*), but also potentially Rothschild's rock wallaby, especially given that the species feeds on both native and non-native grasses (e.g. Buffel), which are present in this habitat type.

Small rodents such as the Delicate Mouse (*Pseudomys delicatulus*) which has not suffered dramatic range declines like most of Australia's native rodents, may occur in the Project Area as the expanse of this habitat type would provide grass seeds that make up majority of the species diet. The Sandy Inland Mouse (*Pseudomys hermannsburgensis*) may also occur, as the species resides within hummock and tussock grasslands creating shallow burrows or using pre-existing burrows and foraging close to cover. The species population fluctuates greatly in response to rainfall. Similarly, varanids (e.g. Short-tailed Monitor, *Varanus brevicauda*), elapids (e.g. Western Brown Snake, *Pseudonaja mengdeni*) and dragons (e.g. Military Dragon, *Ctenophorus isolepis*) are likely to use this habitat, as it provides both cover from predators and suitable substrate for excavating their burrows.

Evidence of Echidna (*T. aculeatus*) was recorded in this habitat type, as well as wild dog/dingo (*Canis* sp.) and feral cat (*Felis catus*) scats. The Northern freetail bat (*Chaerephon jobensis*) was recorded in this habitat type on only one of the trap nights and on one recorder only.

6.3 Samphire Shrublands and Salt Plains

The Burrup Peninsula contains marine alluvial flats and river deltas that support Samphire and mangal ecosystems (mangroves). Although not extensive in a regional context, the intertidal flats around the Burrup contain a variety of marine waders, and these flats are locally significant. The mangrove community is not forecast for disturbance based on the current site layout.

Such areas are important for migratory shorebirds and those that rely on seasonal water availability or opportunistic foraging, such as predatory birds like the Peregrine Falcon, (*Falco peregrinus)*, Eastern Osprey, (*Pandion cristatus)*, and Wedge-tailed Eagle (*Aquila audax)*.

Fauna diversity and density is likely to be low during the dry and pre-wet seasons as there is a lack of canopy cover of this habitat type in the Project Area. This habitat will become increasingly important at times of inundation during high tide when waders and shorebirds use the area for feeding, roosting and potentially nesting (e.g. Red-capped Plover, (*Charadrius ruficapillus*)).

The supra-tidal flats between King Bay and Hearson's Cove, including those within the Project area, contain mangal systems that could support a diverse range of fauna. This includes birds that may use the rich organic marine sediment to forage and potentially nest including Brahminy Kite, (*Haliastur indus))* and Mangrove Golden Whistler, (*Pachycephala melanura*).

Mammals such as the Water-Rat *(Hydromys chrysogaster)* could also reside and forage at low tide among the extensive mangal system. This includes the mouth of King Bay which flows into the tidal flats and smaller mangrove habitat just outside the Project area.

The Northern Coastal Free-tailed Bat (*Ozimops cobourgianus*) is a user of mangroves for roosting, particularly those in adjacent forest and along large waterways. This species was recorded six times on three separate nights according to the bat analysis. It was recorded on 3 of the 4 bat detectors placed around site.

When the area is not inundated, the most common fauna to use the area is the Euro (*O. robustus*). Frequent evidence of this species was found across the flats (tracks and scats).

6.4 Drainage Lines

Rapid weathering of the geology of the area has formed deeply incised narrow valleys amongst the exposed bedrock. These channels trend southwest to northeast and east to west throughout the Burrup Peninsula. The drainage channel present in the Project Area in the southwest corner is quite significant.

The Eucalyptus communities within and beside the watercourses contain large, tall trees that may provide hollows suitable for birds such as the Galah (*Cacatua roseicapilla*) and Little Corella (*Cacatua sanguinea*). Similarly, this habitat provides general roosting, nesting, perching and foraging habitat for the Red-browed Pardalote (*Pardalotus rubricatus*), Red-backed Kingfisher (*Todiramphus pyrrhopygius*) and Black-faced Woodswallow (*Artamus cinereus*). If trees are large enough and have many hollows, some bats such as the Northern freetail bat (*Chaerephon jobensis*), Beccari's freetail bat (*Mormopterus beccarii*), Yellow-bellied sheathtail bat (*Saccolaimus flaviventris*) and Common sheathtail (*Taphozous georgianus*) may seek refuge within this habitat. C*. jobensis* and *T. georgianus* were both recorded during the pre-wet season survey. *T. georgianus* was recorded on all 4 of the bat detectors, on each trap night.

6.5 Rocky Outcrops and Dunes

Additional to the main Project areas at Site C and Site F, a parcel of land, adjacent to the coast and within the PPA area is planned to be developed. The development area will include a shiploader which will be established on a wharf jetty which will be built by PPA. A conveyor will connect this area to a port storage shed which will be located on an existing hardstand area.

The coastal area meets scattered rocky outcrops which adjoin a large outcrop extending to about 100 m north to south (most of this landmass residing outside the development area). The outcropping shifts into red sandy loam dunes with scattered hummock grasses. Further inland, the proposed Urea shed will be placed upon pre-existing hardstand area. The existing Burrup East West Services Corridor (EWSC) will contain another conveyor which will transfer urea from Perdaman's plant (Site C) to the Port storage shed.

This habitat type is likely to support a diversity of reptiles. According to NatureMap, there are several records of the spotted dtella *(Gehyra punctata)* and Tree dtella *(Gehyra variegata)* geckoes from the rocky outcrop just adjacent the coast. The area could support the Pilbara Olive Python, which has been sighted numerous times near the Pluto LNG Park and Karratha Gas Plant. The area to be developed is extremely small in comparison to the wider developed area of the Burrup Industrial Estate that still contains a significant amount of undisturbed habitat similar to that forecast for impact. Some of the species expected to utilise the Rocky Outcrops habitat type in the major development area are likely to occur in this area too.

The main species that could utilise the coastal rocky shore is the Water Rat (*Hydromys Chrysogaster*) which feed on marine invertebrates, crustaceans and turtle eggs. However, they tend to occupy sheltered areas of estuaries containing mangroves and may forage further into coastal/intertidal areas and would not utilise coastal rocky shores solely as a protective habitat. It is unlikely the Water Rat would be utilising the area for feeding due to surrounding development and limited shelter from predators.

Though unlikely, it is plausible that Northern Quoll could be found in this area. There are records of this species in the King Bay Supply Base just south of the Project area and about 2 km northeast in the rocky outcrops south of the Woodside Southern Expansion Lease Yard. This suggests the species may be inhabiting around and within these developed areas for foraging.

Suitable habitat may be directly impacted; however, the impact on fauna would be minimal given the expansive suitable habitat still available in the undeveloped areas.

7 Potential Impacts

7.1 Reduction and / or fragmentation of fauna habitat

To enable the construction and operation of the Project's permanent infrastructure, native vegetation and habitat within the Project footprint will need to be removed. The construction phase of the Project will include the disturbance of approximately 69 ha, which includes native vegetation, salt plains and heavily impacted areas (roads and vehicle tracks), with a snap-back, post-rehabilitation for operational purposes, of up to 47.8 ha.

Table 7-1 provides the estimated area of ground disturbance in each respective project location and the approximate area to be rehabilitated at the conclusion of the construction phase. These amounts are for total disturbance area, including existing vegetation and already heavily impacted.

Table 7-1 Approximate ground disturbance and rehabilitation area of the Project.

Project Location	Estimated Area (ha)		
	Construction Disturbance	Rehabilitation after construction	Operational footprint
Site C	34	-	34
Site F	30 [1.]	21	9
Causeway	1.5	0.2	1.3
Conveyor	1 [2.]	-	1
Roads	2 [3.]	-	2
Port storage / shiploader	0.5	-	0.5

1. Approximately half of the Site F disturbance area was previously disturbed and used as laydown area which has since been partially rehabilitated.
2. The majority of the conveyor will be located within the EWSC which is a bituminised corridor. The area of disturbance in Table 7-1 refers to the section of conveyor, immediately to the west of Site C, prior to it connecting to the EWSC.
3. The area of disturbance for roads includes construction of new access roads to Site C. It does not include the proposed repositioning of Hearson Cove Road to its gazetted location which is to be constructed by others.

7.2 Vehicle Strike

Impacts with moving vehicles can cause injury or death of native fauna. The establishment of new roads and introduction of additional vehicles, particularly during the construction phase, have the potential to adversely impact on fauna. Dusk and dawn periods when some fauna is more active are times when these interactions could be more prevalent.

7.3 Increase in introduced fauna

The introduction of pest species has the potential to increase competition for limited food resources or impact neighbouring roosting sites from endemic species. The importation of modular units has the potential to carry pest species from outside the region.

Similarly, some feral species such as mice, rats, dogs, cats and foxes could be attracted to the facility if food scraps are not managed or disposed of appropriately. The attraction of feral predators such as foxes *(Vuples vulpes)* and cats *(Felis catus)* could result in predation of native species.

While the population of Cane Toads (*Rhinella marina)* is continuing to spread, to date, they have not yet been recorded on the Burrup Peninsula. The potential for lethal toxic ingestion of Cane Toad toxin, though not likely at this time, needs to be considered for the life of Project.

7.4 Light Pollution

Artificial light emanating from the site could attract fauna and alter foraging patterns, increase predation risks, disrupt biological clocks and disrupt dispersal movements impacting breeding and roosting regimes.

Potential sources of light pollution associated with the Project would be the afterhours security lighting and night time lighting needed in key operational areas.

7.5 Noise and vibration

Noise and vibration acts as a general stressor, masks acoustic signals, and can disturb ecosystem balance.

Noise emissions during the construction phase such as large mobile plant movements and blasting associated with earthworks could have a potential impact on fauna. Similarly, during the Project's operational phase, noise emissions from plant, conveyor and loading facilities could impact terrestrial and marine fauna.

7.6 Fauna Entrapment and Poisoning

During the construction phase open pits and trenches will be established and kept open temporarily. During this time, fauna can become trapped and if not removed quickly have the potential to die due to exposure during hot daytime temperatures.

The collision of ghost bats into wire fences is a key threat for this species.

Pest species such as mosquitoes have the potential to populate on site stormwater and brine storage ponds. Using chemical controls, such as larvicide or adulticide, has the potential to adversely impact native fauna, particularly avifauna, including migratory birds.

8 Mitigation and Management Measures

The successful implementation of the following mitigation and management measures have the potential to significantly reduce the impact of the Project on the local fauna.

8.1 Minimise Disturbance of Habitat

No clearing is to be undertaken unless it complies with the Project's approval conditions. This includes any ground disturbance activities outside the Project footprint and, or in excess of the total area limits.

All clearing shall be minimised and only be undertaken to the extent required to safely and efficiently complete the works.

All clearing shall be limited to the battery limits defined in the relevant GDP issued for disturbance or works to which it applies. No additional clearing will be undertaken without the revision or issuance of another GDP.

8.2 Fauna Removal from Impacted Areas

Inspections and removal of native fauna from all habitat / microhabitats prior to clearing. This may require starting up machinery ten minutes before disturbance activities commence and bumping / shaking of habitat trees to encourage fauna to vacate area.

Native fauna will, wherever possible, be allowed to make its own way from the construction footprint. Where relocation may be required, any fauna capture, handling and relocation to be conducted in accordance with Department of Biodiversity, Conservation and Attractions Parks and Wildlife Service Standard Operating Procedures, by a licensed fauna handler.

Open trenches will be managed during day and night-time hours to prevent ingress and trapping risks to native fauna. Trenches will be left open for shortest period practicable.

8.3 Creating Habitat

Fauna habitat shall be recreated as part of the site rehabilitation at the end of the construction works. The subcontractor is to salvage and re-use habitat elements (for example hollow logs, rocky outcrops) in rehabilitation where practicable.

8.4 Traffic Management

Site speed limits are to be set and obeyed to avoid vehicle / fauna interactions. Vehicle operators must yield right-of-way to fauna, unless unsafe to do so.

8.5 Food Sources for Fauna

Waste will be stored in a way that does not attract vermin or native fauna. Bins and skips will have lids and be labelled and maintained to hold the intended waste stream securely.

Fauna shall under no circumstance be fed or attracted to or within the Project area with food.

8.6 Light Pollution at the Port

Light pollution impacts around the Port area will be managed to avoid impact on marine turtles.

This includes:

- Temporary lighting plant being oriented away from the water;
- Turtle sensitive lighting is to be installed around the wharf area that is in the turtle's low visual sensitivity range (i.e: 580 nanometres or longer), such as amber, yellow or red in colour;
- Avoid the use of white lights;
- Where practicable, lighting should be kept low, shielded and directional, away from water where possible, to minimise horizon glow;
- As far as practicable, minimise light intensity in nearshore areas.

8.7 Fencing

No barbed wire is to be used on any fences during the construction or operation phases of the Project. Site security measures will be developed that excludes the use of barbed wire.

In lieu of barbed wire, the top strand of wire should be single strand. Markers will be used to highlight the barrier and positioned up to 2m apart. This could be a metal disk (approximately 10cm x 10cm) between the top and second strands. Other similar markers that could be used, with consideration for their potential to become waste to the environment, include tape, flags, bunting etc.

8.8 Feral Animal Trapping

Perdaman will consult with PPA and Yaburara and Coastal Mardudhnuera Aboriginal Corporation (YACMAC) Marduthuni Rangers to monitor and control pest fauna (particularly feral cats) during construction and operational activities associated with the Project.

8.9 Changes to water quality at MUBRL outfall

Exceedances of the Water Corporation's water quality licence limits could result in wastewater discharge to the MUBRL impacting marine environmental quality at the outfall point.

8.10 Surface water quality

Degradation of water quality from elevated levels of suspended solids or contaminants in surface water runoff from sites C and F, entering the intra-tidal flat, could have an indirect impact on the mangrove communities of King Bay. Similarly, the Project could impact marine environmental quality via runoff collected from the hardstand surfaces, conveyor, and product storage shed within the Port area.

The Project's air emissions have the potential to impact marine environmental quality.

Figure 8-1 Mitigation measures of potential impacts to fauna species.

Potential Impacts	Mitigation Measures
Objective: To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	
Reduction and / or fragmentation of fauna habitat Clearing of vegetation can lead to direct loss or fragmentation of fauna habitat.	**Avoid** The original processing facility layout was forecast to impact 21.3 ha of the tidal flats and Samphire Shrubland/Saltplains habitat. Following design optimization, proposed clearing of this habitat type has been significantly reduced. Limit clearing to that which is absolutely necessary. Avoid clearing of rocky/boulder habitat that may contain micro-habitat suitable for refuge for some small terrestrial mammal species, including the Pilbara Olive Python. Impact on the creekline in the south-west of Site F, which is likely to be used by the Ghost Bat for foraging, will be avoided: location of the construction fenceline has been modified accordingly. High quality vegetation located on the northern margins of Murujuga National Park (southern perimeter of Site F) has been avoided by selecting the northern Hearson Cove Road re-alignment option. **Minimise** The entire project layout has been redesigned to minimise habitat fragmentation. The tidal flat area is no longer being reclaimed and raised to a level to support construction. Instead, the processing plant will be located on Site C and Site F will contain administrative buildings and a designated laydown area for construction. The two sites will be joined across the tidal flats by a small causeway enabling access between the two sites. The causeway will contain large culverts to maintain hydrological and tidal flows and also allow fauna to freely move through the structure. Do not disturb rock piles between the months of early November to late April where practicable as this is a time of inactivity for the Pilbara Olive Python and a period where individuals are slow to move and unable to avoid impact from land clearing. Maintain denning habitat by avoiding disturbance to rock piles on the upper slopes of the valleys. Bury concrete or steel structures of a suitable size to a suitable depth where practicable in the rock batters used to elevate and stabilize the plant to create potential day time or maternity roosts. Develop and implement a GDP system prior to the commencement of construction. Prior to any clearing, a GDP is required to be approved by the site Environmental Officer. Preferential clearing will occur for well represented habitat types over other habitat types that do not cover significant portions of the site. Land clearing to commence no more than six months prior to commencement of construction. Clearing will be planned to maximise the 'area to perimeter' ratio of remnant vegetation. Clearing of vegetation will be kept to a minimum necessary for safe and efficient construction and operation. Land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site. Plan clearing to retain vegetation where possible, such as around carparks and infrastructure, and landscaped areas. **Rehabilitate** Following construction, ensure that any disturbed habitats (laydown areas) are returned to their pre-disturbance state to reduce the overall impact of habitat loss. Attempt to reinstate valuable microhabitat elements to the landscape to encourage use of the periphery of the site by this conservation-dependent fauna. Construction of the processing facility on the slopes of Site C and F will require significant cut and fill to bring levels up. The scheduling for materials dumped to fill could be manipulated to ensure large boulders are grouped as conglomerates around the periphery of the retaining batters.

Potential Impacts	Mitigation Measures
	These large boulders should then, by virtue of their position in the batter slopes, offer potential cave and crevice habitat for the Pilbara Olive Python, contributing to the availability of secure refuge in the local area.
Vehicle strike Impacts with moving vehicles can cause injury or death of native fauna.	**Minimise** Vehicle speeds will be managed on site (including entry and exit points) by enforcing speed limits in construction areas to reduce the potential for vehicle strikes. All employees will be required to record and report any native fauna strikes. Roadkill will be removed at least 10 m into surrounding vegetation, when safe to do so, by designated personnel to avoid further strikes of fauna feeding on carcasses. Site induction to emphasise that all native fauna has right-of-way, where possible and safe to do so. Personnel will be inducted regarding the key risk times for vehicle strike to fauna (e.g. dusk and dawn). Where possible, all non-essential movement will be scheduled to take place during the day. Site inductions to introduce personnel to local conservation significant fauna, and signage displayed in crib rooms and notice boards, to ensure all personnel can identify all larger conservation significant species.
Increase in introduced fauna Food waste and increased water availability within the Project Area could potentially increase introduced fauna numbers. Cane Toad populations may in future migrate into the Burrup Peninsula.	**Avoid** No domestic animals will be allowed on site. **Minimise** Predator control (wild dogs *Canis lupus familiaris*, feral cats *Felis catus*, red foxes *Vulpes vulpes*) has been identified as an absolute priority to minimise the impact of the Project. Initiate a feral fauna trapping and euthanisation program to reduce the number of feral fauna around the site. Introduce and implement hygiene procedures which result in the reduction of food waste around the processing facility to ensure that feral predators are not attracted to the facility. Develop and implement an introduced predator control program. Liaise with PPA and YACMAC Rangers and participate in existing and/or planned catchment wide pest animal management programs (i.e. Feral Cat control). Develop a Cane Toad Monitoring Program Develop a Cane Toad Control Program for potential future implementation.
Lighting Artificial light can alter foraging patterns, increase predation risk, disrupt biological clocks, and disrupt of dispersal movements.	**Minimise** Lighting will be designed in accordance with *AS 4282-1997: Control of Obtrusive Effects of Outdoor Lighting Guidelines*. Lighting will be used only for required operational areas, all light sources will be aimed towards specific work areas requiring light for safe construction and/or operation, with a low vertical angle, and light shields will be placed on large equipment to minimise light spill over. Where possible, lighting will be the minimum wattage, whilst not compromising safety or OH&S requirements.
Noise and vibration Noise and vibration acts as a general stressor, masks	**Minimise** Noise emissions will comply with *Environmental Protection (Noise) Regulations 1997*. Maintain equipment such that all noise emitting equipment is fully serviceable and working to the correct specifications.

Potential Impacts	Mitigation Measures
acoustic signals, and can disturb ecosystem balance.	Where possible, all non-essential movement will be scheduled to take place during the day.
Fauna entrapment and poisoning Fauna may be trapped in artificial water bodies and excavations leading to injury and/ or death.	**Minimise** Horizontal wire strands or barb wire fences will not be used on site during or following construction. If the site must be fenced for security, barbed/razor wire should be placed at the base of the fence on the ground and the fence itself must be cyclone mesh. Fauna egress will be installed on all excavations, even if temporary. All excavations will be checked for trapped fauna within three hours of sunrise if left open overnight. All fauna should be removed by qualified personnel. All excavations that must be left open for more than 12 hours must have gentle ramped egress that all fauna are capable of using. Where practicable avoid the use of larvicides and adulticides for chemical control of mosquitoes in on-site storage ponds. Should larvicide or adulticide be applied, Perdaman shall develop a management plan to ensure the protection of native fauna.
Changes to water quality Wastewater discharge to the MUBRL has the potential to impact on marine environmental quality.	**Avoid** The objective is to ensure that the seawater blow down discharge to MUBRL, in combination with other future industrial discharges to the MUBRL, will not compromise the ability of the Water Corporation to meet the requirements of Ministerial Statement 594 and the ANZECC and ARMCANZ (2000) species protection level water quality guidelines within the 0.01 km2 mixing zone as recommended in the EPA Report 1044. In principle there are three balances to consider: ▪ Water – which contains site seawater, storm water, potable and grey water, process water and various condensates, including condensed air moisture. ▪ Salts – deriving (mainly) from seawater, but also some from dosing chemical additions – effectively as TDS (and measured as conductivity). ▪ Thermal – managing the average blowdown return temperature. The Project can extract water from the seawater provided the concentrated salts of the blowdown comply with the ANZECC guidelines. ▪ Most of the seawater use (ca. 95%) is via the site circulating seawater cooling system. This circulates seawater removing process heat with seawater cooling tower, with roughly a 1.4 cycle of concentration (CoC). ▪ Essentially pure water evaporates (cooling), and the salts in the circulating seawater are concentrated. ▪ There are virtually no additional salts added – there is a modest (small) sulfuric acid and hypochlorite dosing for pH control and bio growth inhibition. ▪ There is no addition of heavy metals, as the process is based on clean natural gas. For seawater all the heat exchangers are constructed of titanium to reduce corrosion. ▪ In extreme cases some biocide may be added to control bio growth, but not during normal operation. Following this and measurement, sodium metabisulphite would be added and mixed to the blowdown water to decompose the residual biocide. ▪ The expected drift loss is expected to be <0.001% of the circulating flow. This drift loss is at the same salinity of the cooling tower circulation flow. ▪ There is a continuous blowdown which is operated to the specified conditions set by the Water Corporation, in order to meet the ANZECC and ARMCANZ (2000) species protection level water quality guidelines. This is summarized as below (Water Corp Technical Compliance Advice bulletin Ref. PM20992155 (22 Feb 2019)) and provided in **Error! Reference source not found.**.

Potential Impacts	Mitigation Measures
	Minimise The Brine evaporation pond is required for operational flexibility: ▪ Such as if/when the brine return is offspec (i.e. will not be accepted by Water Corporation with respect to not meeting the ANZECC specifications); ▪ Operating flexibility to deal with saline streams in excess of 55,300 mg/l TDS; ▪ Site stormwater overflow; ▪ Collection of contaminated chemical sewer streams other than Amine section; ▪ During normal operation the pond is expected to be dry – the site evaporation rate is high, and minimal salt containing streams should be added; ▪ During start-up, high salt (>55,300 TDS) brine is expected from the Desalination Plant. This could be diluted and returned to the MUBRL, however temporary storage in the brine pond allows minimisation of seawater usage. Further, there could be ammonia water streams; ▪ Once the main plant is operating and MUBRL blowdown established, the Brine pond water will be fully analysed and should this be acceptable, blended back into the blowdown stream as a small addition, ensuring outfall compliance is not compromised. This disposal is considered feasible as under normal operating circumstances the water should basically contain high saline seawater and possible traces of ammonia – both these components are acceptable to the MUBRL ocean outfall mixing zone provide the mixed stream complies with the criteria – i.e. ensure TDS is <55,300mg/l and the ammonia does not exceed 1,700 mg/m3 of blowdown; ▪ In the unlikely event that the Brine pond water with blending is still outside the ANZECC specification, the water will be evaporated, and the residual salt collected to an approved disposal site; ▪ The Brine pond specifically will not receive organic (grey water) nor MDEA nor oil containing wastewater; and ▪ The Brine pond has transfer pumps and reticulation to receive and pump out water.
Water Quality Degradation of water quality from elevated levels of suspended solids or contaminants in surface water runoff. Indirect impact on the mangrove communities of King Bay as a result of water quality changes. Impacts on marine environmental quality from runoff collected from the hardstand surfaces, conveyor, and product storage shed within the Dampier Port area Impacts on marine environmental quality from Project air emissions.	**Avoid** The design scope for the fully enclosed conveying and ship loading system eliminates of the risk of loss of urea product as fugitive dust emissions or spills with the consequential loss of valuable product and potential environment impacts of degradation of water quality in the terrestrial and marine environments. **Minimise** Best available technology design has been incorporated to reduce and minimize Project air emissions. This in turn minimizes any potential impacts on marine environmental quality from Proposal air emissions. An Operational Environmental Management Plant (OEMP) is required to be prepared and submitted for review prior to any operational activities taking place on PPA's lands. It is a standard requirement of PPA's Commercial Agreements with tenants. An OEMP is a practical and site-specific plan of management measures which is designed to manage risks and minimise environmental impacts from PPA's tenant's normal activities. It will also identify what measures will be in place or are actioned to manage any incidents and emergencies that may arise during normal operations. As such, the foundation of any OEMP is an operational environmental risk assessment. An OEMP is a dynamic document, which should be maintained and audited periodically to ensure it reflects current environment risks and management measures from site activities and operations ***During Construction*** ***Drainage, Erosion and Sediment Pollution Controls*** The following controls shall be installed prior to commencement of construction to prevent contamination of surface water and receiving environments.

Drainage Controls

- Existing drainage lines will be protected and any diversion of these lines should be kept to a minimum.
- Flow management across the site will prevent the concentration and diversion of waters onto steep or erosion prone slopes.
- Any diversion of drainage lines will be directed to slopes that are not prone to erosion.
- External water flows entering the Project's battery limits will be diverted around the construction footprint, using drainage structures such as catch drains and bunds.
- Temporary drainage structures will be designed to reduce run-off velocities by using wider inverts, flat bottomed drains rather than V-shaped drains, check dams (or similar), silt fencing and revegetation of completed areas.
- All drainage lines likely to receive run-off from disturbed areas, such as those downstream of worksites, will be fitted with geotextile silt fences. Rock checks should also be used in drains to slow flows and provide a lining to prevent scouring of underlying surfaces. Sediment basins will be added to drainage lines as necessary. Basins shall be designed relative to the catchment and likely flow levels for higher rainfall events.
- Where silt fences are installed for sediment control, they must be constructed with a centre section lower than the ground levels at the end of the silt fence to avoid outflanking during heavy rainfall events.
- Silt and sediment fences shall be maintained until the areas above them have been adequately stabilised to minimise the erosion risk such that the controls can be removed.
- All stormwater proposed for discharge will first be contained in an appropriately lined sediment basin, to all sediment to settle out.
- Any discharge to the MUBRL must comply with the conditions, including water quality standards of the license or approval that applies to the discharge.
- Construction activities will be scheduled to avoid periods of heavy rainfall, strong winds or peak water flow.

Erosion and Sediment Pollution Controls

Sediment controls are designed to prevent the transportation of sediment and other pollutants from worksites to waterways. They will be installed across the Project sites in areas where land is disturbed. In order to minimise the land exposure and potential risk of erosion, all land disturbances should be confined to a minimum practical working area and within the vicinity of the identified work areas.

Where possible, existing vegetation surrounding the construction site will be used as a buffer zone to help filter surface runoff and should not be disturbed unless necessary for the purpose of construction.

To ensure that silt from batters, cut-off drains, table drains and road works is retained on site and replaced as soon as practicable, sediment controls will be installed downstream of any disturbed land such as worksites, prior to that work being undertaken.

Run-off controls will be developed and maintained to the following standards:

- Controls will be designed to take predicted flows, based on 140436-000-41EG-0001 Standard Specification Geographic, Climatic and Wind / Seismic Data.
- Exposed ground will have control measures that minimise the level of erosion.
- Drains will be installed across the site to divert clean surface water to stable areas and away from parts of the site where soil is exposed.
- Installation of sediment traps and basins with a riser pipe or flexible pipe and spillway to avoid adverse flood risk to adjoining properties. These systems shall allow for the gradual discharge of the clearest water during a storm event as detailed in 6.1.3.
- Geotextile silt fences shall be installed in surface water flow areas to minimise the sediment discharge from the site (refer to Attachment C).
- Should hay bales be used for sediment control, they will be made of straw sourced from cereal crops and be free of weed seeds.
- If any areas of localised erosion develop, they will be remediated as soon as practicable to prevent further erosion or sediment deposition in offsite areas.

Potential Impacts	Mitigation Measures

- Regularly inspect stormwater drainage and sediment control structures to ensure hydraulic integrity and erosion and pollution control effectiveness. If the control structures are obstructed or have their capacity reduced by 30% or more through the accumulation of silt, litter, vegetation and other debris, they shall be cleared, with silt returned to a stabilised part of the project.
- Sediment control structures at waterway crossings will be developed during the detailed design process before any such work takes place.
- Throughout construction, rehabilitation of disturbed areas will be progressively undertaken, or as soon as practicable, following completion of specific works.

Post- Construction

The following principals shall be applied:

- The granular urea product is much harder than prilled urea, therefore creating less fines and dust when handled and transported which minimizes the urea fines and dust that could be accidentally released during conveying and ship loading activities.
- Spill contingency and emergency response plans and procedures that align with the appropriate PPA plans and procedures, will be developed and implemented to address environmental risks and potential impacts specifically related to the operational phase
- The stormwater pond includes an oil skimmer for removal of oil traces. These are sent to the Oily water collection pit/processing.
- Water quality monitoring (analysis) of collected water before allocation of use will be undertaken. It is expected that the quality of the stormwater will be (much) better than seawater (a much lower salt content), and as such can be re-used to reduce seawater make-up in the circulating cooling system.
- Collected stormwater is pumped to the seawater cooling tower circulating basin. The make-up seawater it is replacing is up to 3,000 m^3/h.
- For paved areas of the urea processing plant, there will be stormwater collection pits (epoxy coated concrete pit) where the first 15mm of stormwater can be collected. Stormwater collected will be treated by steam stripping or other means to bring ammonia (Total Kjeldahl Nitrogen) in water within limit.

Ongoing Monitoring

Regular inspections and audits will be undertaken to ensure the environmental protection outcomes of the Project are achieved. Inspection and maintenance activities will follow the Monitoring and Compliance requirements outlined in the Construction Environmental Management Plan (CEMP) and will include:

- Review of Erosion and Sediment Control Plans and validate that the proposed erosion and sediment controls have been implemented and, where relevant, revised to accommodate the changing environment.
- Inspections to observe and record any scouring, erosion and sediment transfer particularly beyond the Project footprint.
- Cleaning of sedimentation basins when the accumulated sediment has reduced the basin capacity by more than 30%, as indicated by depth pegs.
- Cleaning of all drains to remove silt, vegetation (where capacity is reduced) and litter.
- Weekly inspection of access roads and hardstand areas to identify erosion damage in need of maintenance. Remediation is to occur within one month or earlier if heavy rains are likely.
- Discharge from any oily water separator shall be monitored to ensure it contains less than 5ppm Total Recoverable Hydrocarbons (TRH) and is in compliance with Project approval conditions before it can be used for dust suppression or discharged into the environment. Written approval from the Contractor's Environment Manager must be obtained prior to reuse or discharge to the environment.

Contingency measures include:

- Where erosion or sediment deposition occurs, rehabilitation corrective actions shall be implemented as soon as practicable.
- Where sedimentation occurs the source of the sediment should be determined to identify likely erosion in up gradient areas. The sediment should be removed and deposited, if possible as part of erosion controls.

Potential Impacts	Mitigation Measures
	▪ Where erosion is identified and requires rehabilitation the impacted area shall be filled, compacted and contoured to merge with the surrounding landscape.

9 Monitoring and Maintenance

Perdaman will undertake regular reviews of environmental management practices for fauna. Site inspections to assess the effectiveness of all fauna management measures will be undertaken with corrective actions implemented by relevant Project personnel.

Fauna observations and sightings within the Project area will be recorded and, where required, corrective actions will be implemented should any adverse fauna impact be likely.

9.1 Fauna Database

A Conservation Significant Fauna Database will be developed and maintained for the Project. The database will include information reported monthly using the Fauna Sightings Register and Fauna Translocation Register.

9.2 Review of Procedures

This FaMP will be reviewed periodically (approximately every twelve months) to assess the effectiveness of its measures and maintain relevancy to current operations.

Should performance of controls be inadequate then the measures we be updated to achieve performance objectives. Additional review will be required in the event of a fauna related incident.

9.3 Inspections and Monitoring

Regular inspections and audits are required to ensure appropriate implementation of the fauna management measures outlined in this Plan. Inspection and maintenance activities will follow the monitoring and compliance requirements outlined in the PEMP and this Plan.

10 Reporting

Compliance with the FaMP will be reported in a timely manner to Perdaman's Environment and Heritage Manager after each inspection and audit. Corrective actions will be recorded and monitored as per the Contractor's non-conformance tracking system to ensure continual improvement and enable the close out of incidents.

Any fauna related incidents shall be reported to the Contractor's Environmental Representative as soon as possible.

It is expected that all incidents be reported and investigated utilizing the SNC-Lavalin Health, Safety, Security and Environment Incident Investigation Standard Operating Procedure (HSSE IISOP) and associated form(s). For recordable and / or high potential incidents, root causes must be established using the Incident Cause Analysis Methodology (ICAM), as detailed in the HSSE IISOP. The final incident investigation report must be submitted to the Contractor's line management, the Sector Health, Safety, Security and Environment President and uploaded into BlueSky within 14 days.

Monthly reporting undertaken by Subcontractors shall be reported as per 140436-0000-39GA-0001 – Monthly Reporting Calendar and shall include the Fauna Sighting Register and the Fauna Translocation Register for the previous reporting period.

Annual fauna management reports will be prepared by Perdaman for submission to the appropriate Regulators.

These will include:

- Details of all fauna inspections;
- The number and type of fauna cleared from trenches;
- Fauna mortalities;
- Incident response measures undertaken; and
- Corrective actions and monitoring programs implemented.

11 Definitions

Ground Disturbance Permit

A Ground Disturbance Permit (GDP) is a permit issued by Perdaman, enabling Works within defined battery limits to manage any impacts on native vegetation, heritage or other environmentally sensitive values. It includes the key approval commitments and obligations obtained by or issued to the Project by regulators, tenure holders and other third parties.

Operational Environmental Management Plan

An Operational Environmental Management Plan (OEMP) is a plan specifically developed for port related activities and is developed specifically for Pilbara Port Authority requirements. This plan will be developed, reviewed and approved prior to the commencement of Port construction activities.

Project Personnel

Project Personnel includes all persons working on the Project directly employed by Perdaman, or its Contractors.

Shall

Indicates that a statement is mandatory.

Should

Indicates a recommendation.

Threatened Species

Threatened species are those species classified as Lister Threatened Species under the EPBC Act.

12 Abbreviations

Abbreviation	Description
APM	Animal Plant Mineral
BSIA	Burrup Strategic Industrial Area
DBCA	Department of Biodiversity Conservation and Attractions
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
EPC	Engineering, Procurement and Construction
EWSC	Burrup East West Services Corridor
FaMP	Fauna Management Plan
GDP	Ground Disturbance Permit
Mtpa	Million tonnes per annum
OEMP	Operational Environmental Management Plan (PPA specific)
PEMP	Project Environmental Management Plan
PPA	Pilbara Ports Authority
YACMAC	Yaburara and Coastal Mardudhnuera Aboriginal Corporation

13 Reference Documents

Document Reference / Number	Document Title
APM, 2019	Perdaman Urea Project – Pre and Post-wet Season Biological Survey
CAR002_GBMP_v01	Perdaman Urea Project Ghost Bat (*Macroderma gigas*) Management Plan
CW1055600-EN-PL-001	Environmental Management Plan
Worley Astron, 2006	*Pluto LNG Development Desktop Fauna Report 2006*. Unpublished report for Sinclair Knight Merz

14 Codes and Standards

Document Number	Document Title

15 Project Delivery Applicability

☐	Proposals	☒	EPC	☒	Construction
☐	Studies	☒	Project Management	☒	Commissioning
☒	Preliminary Engineering	☒	Technical Services	☐	Site Services
☒	FEED	☒	Procurement	☒	Ops and Maintenance
☒	Detailed Design	☒	Construction Management	☐	

Attachment A – Pre and Post-wet Season Biological Survey

Refer to Environmental Review Document Appendix B

Attachment B - Marine Fauna Desktop Assessment

Refer to Environmental Review Document Appendix C