PERDAMAN
INDUSTRIES
CHEMICALS & FERTILISERS

Threatened Species Management Plan

Project Ceres

Burrup Peninsula, Western Australia

PCF-PD-EN-TSMP

Proponent:

Perdaman Chemicals and Fertilisers Pty Ltd.

ABN: 31 121 263 741

Date: 05 December 2024

Ministerial Statement: 1180

Assessment No:

2184 (WA)

2018/8383 (Commonwealth)

PERDAMAN
INDUSTRIES
CHEMICALS & FERTILISERS

Contact Information

Perdaman Chemicals and Fertilisers Pty Ltd.ABN 31 121 263 741

58 Mounts Bay RoadPerth WA 6000 Australia

www.perdaman.com.au

Phone +61 8 9429 5111
Fax +61 8 9429 5100

Document Information

Prepared by Perdaman Chemicals andFertilisers Pty Ltd.

Project Name Perdaman Urea Project

File Reference PCF-PD-EN-TSMP

Job Reference PCF-PD

Date 17 December 2024

Version Number PCF 7

Review conducted by:

Name: Saipem Clough Joint Venture

Effective Date: 17 December 2024

Approved By: Simon French-Bluhm

Name: Vikas Rambal
Job title: Chairman

Date Approved: 17 December 2024

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
A	16/03/20	Developed for DMA review	BR	DH
PCF 1	12/01/2021	Response to Submissions	Cardno	Cardno
PCF 2	25/02/2021	Response to Submissions	Cardno	Cardno
PCF 3	21/03/2021	Response to Submissions	Cardno	Cardno
PCF 4	09/02/2022	Submission for DCCEEW Approval	SCJV	Perdaman
PCF 5	23/02/2022	DCCEEW Comments Addressed	SCJV	Perdaman
PCF 6	01/03/2024	Revision to include changed Management Actions. Structural change to document. Removal of duplicate information. Addition of relevant survey data. Addition of Section 40 of the Biodiversity Conservation Act 2016 and Regulation 28, Biodiversity Conservation Regulations requirements. Changes recorded in Section 13. Changes facilitate night works	SCJV	Perdaman
PCF 7	17/12/2024	DCCEEW Comments Addressed	SCJV	Perdaman

© Perdaman. Copyright in the whole and every part of this document belongs to Perdaman and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Perdaman.

This document is produced by Perdaman solely for the benefit and use by the client in accordance with the terms of the engagement. Perdaman does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Perdaman is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Declaration of accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

Full name (please print) Simon Paul French-Bluhm

Organisation (please print) Saipem Clough Joint Venture

Date 17/12/2024

Executive Summary

Proposal Title	Perdaman Urea Project
Proponent name	Perdaman Chemicals and Fertilisers Pty Ltd.
Assessment Number	2184 (WA) & 2018/8383 (Commonwealth)
Ministerial Statement No.	Ministerial Statement Number 1180
Construction & Operations Commencement Dates	Bulk earthworks are scheduled to commence in September 2023. Construction is scheduled to commence in June 2024. Operation of the facility is proposed to commence 2027.
Purpose of the TSMP	This Threatened Species Management Plan (TSMP) has been prepared to comply with the conditions for Project Ceres implementation set out in the *Environmental; Protection Act 1986* Ministerial Statement (MS 1180), the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval 2018/8383, and the *Biodiversity Conservation Act 2016* (BC Act) Approval TFA 2223-3017. The TSMP has been prepared in accordance with Condition 5 of MS 1180. The purpose of this TSMP is to provide a framework which describes how Project Ceres will address, manage, monitor and mitigate impacts on threatened fauna species and habitats. This TSMP provides monitoring actions for threatened species and habitats to demonstrate compliance with the environmental outcomes included in Condition 5-1, the environmental objective in Condition 5-2 of MS 1180, and the approvals granted under the EPBC Act and BC Act. This plan supplements the PCF-PD-EN-PEMP Project Environmental Management Plan (PEMP) and PCF-PD-PN-FaMP Fauna Management Plan and PCF-PD- PN-FMP Flora Management Plan.
Key environmental factors and objectives	The environmental outcomes for threatened terrestrial fauna are associated with the EPA Factor: To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. The Environmental Outcomes (as provided in the Ministerial Statement (Condition 5-1)) are as follows: • clearing in the fauna habitat type identified as Rocky Outcrops shall not exceed 0.16 ha. • clearing in the fauna habitat type identified as Hummock Grasslands on Mid-slopes shall not exceed 49.17 ha. • clearing in the fauna habitat type identified as Samphire Shrublands / Supratidal flats shall not exceed 11.97 ha. • clearing in the fauna habitat type identified as Drainage Lines shall not exceed 2.7ha. • impacts to short-range endemic fauna species are avoided, unless it is demonstrated, and the CEO confirms in writing that the species occurs in a self-sustaining population outside the development envelope. The Environmental Objective (as provided in the Ministerial Statement (Condition 5-2)) is as follows: • minimise direct and indirect impacts to the northern quoll, Pilbara olive python and the ghost bat within the development envelope. An objective of the EPBC Act is to help to protect threatened animals, plants and habitats.
Condition clauses	Condition requirements of MS 1180, EPBC Approval 2018/8383, and BC Act Approval TFA 2223-3017 for the management of threatened fauna species have been detailed in Appendix 1 - Environmental Approval Conditions.
Key provisions in the plan	The TSMP's key provisions are included in Section 8. This section details the outcome and management-based actions, that will be applied for the life of Project Ceres against each of the potential impacts.

Foreword

This Threatened Species Management Plan (TSMP) 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 associated management plans is illustrated in Figure 1-1.

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

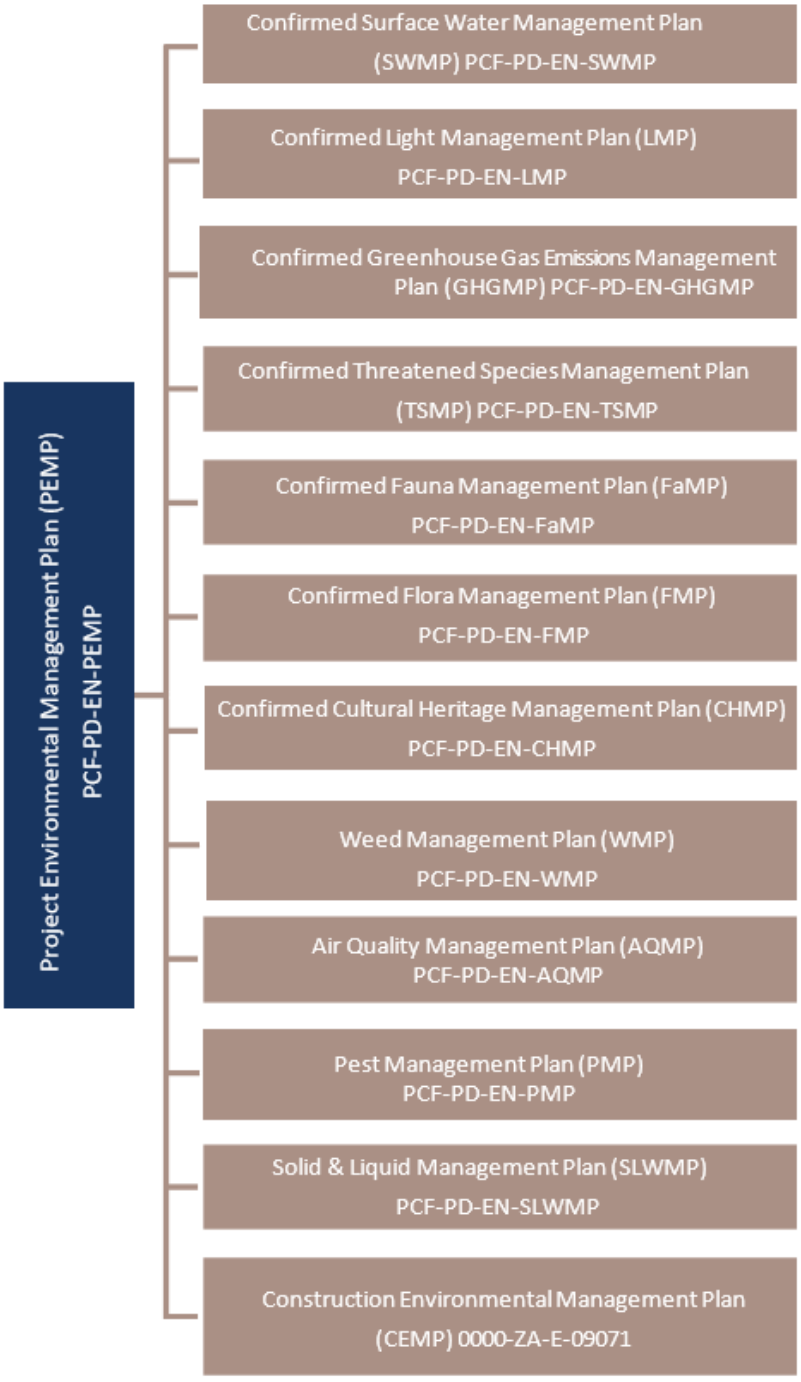


Figure 1-1 Structure of Project Ceres Environmental Management Plan and supporting management-plans.

Table of Contents

1 Context, Scope & Rationale 1
1.1 Proposal Description 1
1.2 Scope & Requirement of the Plan 5
1.3 Responsibility 6
1.4 Key Environmental Factors 7
2 Legislative Framework 9
2.1 Environmental Protection and Biodiversity Conservation Act 1999 9
2.2 Environmental Protection Act 1986 9
2.3 Biodiversity Conservation Act 2016 11
2.3.1 Proposed Changes to Authorisation number TFA 2223-0317 13
2.4 Biodiversity Conservation Regulations 2018 14
2.5 Policy and Guidance 15
3 Roles and Responsibilities 17
3.1 Project Director 17
3.2 Manager 17
3.3 Environment and Heritage Manager 17
3.4 Environment Coordinator 18
3.5 Construction Manager 18
3.6 Operations Manager 18
4 Rationale & Approach 20
4.1 Study and Survey Findings 20
4.1.1 Technical Memorandum – Assessment of Proposed Changes to Management Actions 21
4.2 Terrestrial Vertebrate Fauna 22
4.2.1 Desktop Assessment 22
4.2.2 Field Survey 22
4.3 Avifauna / Migratory Birds 26
4.3.1 Desktop Assessment 26
4.3.2 Field Survey 26
4.4 Marine Fauna 27
4.4.1 EPA Assessment 1705 27
4.4.2 Desktop Assessment 28
5 Fauna Habitat 30
5.1 Rocky Outcrops 30
5.2 Hummock Grasslands on Mid-Slopes 30
5.3 Samphire Shrublands and Salt Plains 31
5.4 Drainage Lines 31

6 Potentially Impacted Species 34
6.1 Listed threatened species and communities (sections 18 and 18A) EPBC Act 1999 34
6.1.1 Ghost Bat (Macroderma gigas) 34
6.1.2 Northern Quoll (Dasyurus hallucatus) 35
6.1.3 Pilbara Olive Python (Liasis olivaceus barroni) 36
6.1.4 Night parrot (Pezoporus occidentalis) 37
6.1.4 Marine fauna 38
6.2 Listed migratory species (sections 20 and 20A) EPBC Act 38
6.2.1 Migratory Birds 38
6.2.2 Migratory Marine Fauna 39
6.3 Conservation Significant Vertebrate Terrestrial Fauna 39
6.3.1 Northern Coastal Free-tailed Bat (*Mormopterus cobourgianus*) 40
6.3.2 Bilby (Macrotis lagotis) 40
6.3.3 Pilbara leaf-nosed bat (Pilbara form) (Rhinonicteris aurantia) 40
7 Risks to Threatened Species 42
7.1 Reduction and / or Fragmentation of Terrestrial Fauna Habitat 42
7.2 Vehicle Strike 43
7.3 Increase in Introduced Terrestrial Fauna and Weeds 43
7.4 Light Pollution 43
7.5 Noise and Vibration 43
7.6 Fauna Entrapment and Poisoning 44
7.7 Marine Environmental Quality 44
7.8 Inland Water Flows and Water Quality 44
7.9 Waste Management 45
7.10 Fire 45
7.11 Dust 45
7.12 Risk Assessment of Impacts to Threatened Species 45
8 Mitigation and Management Actions 50
8.1 Additional Mitigation Strategies for Implementation for Night Works During Construction and Commissioning 160
9 Training and Awareness 163
9.1 Project Inductions 163
9.2 Training Records 163
9.3 Ground Disturbance Permits 164
10 Stakeholder Consultation 165
10.1 Internal and External Communication 165
10.2 External Incident Notification 165
11 Non-Conformance and Incident Management 166
11.1 Environmental Incident Response 166

11.2 Incident Reporting and Investigation 168
11.3 Non-Conformance Management 168
11.4 Emergency Management 170
12 Environmental Monitoring and Reporting 171
12.1 Pre-clearance survey 171
12.2 Environment Monitoring 172
12.3 Environmental Inspections 172
12.4 Contingency Actions 172
12.5 Environmental Audits 172
12.6 Environmental Reporting 173
12.7 EPBC Act Approval 2018/8383 Annual Compliance Report 174
12.8 Ministerial Statement 1180 Compliance Assessment Report 174
12.9 Ministerial Statement 1180 Environmental Performance Report 175
13 Threatened Species Management Plan Review 176
14 Changes to the TSMP 177
15 Definitions 181
16 Abbreviations 182
17 References 183
18 Project Delivery Applicability 187
Appendix 1 - Environmental Approval Conditions (Terrestrial Fauna) 183
Appendix 2 - Stakeholder Consultation Register 184
Attachment A - Marine Fauna Desktop Assessment 189
Attachment B - Pre- & Post-Wet Season Biological Survey 190
Attachment C – GHD Technical Memorandum, December 2023 191
Attachment D - MAC Consultation - 24th Jan 2022 192
Attachment E - Letter to EPA for MAC Consultation on Project Destiny 193
Attachment F - MAC Consultation – August 2023 194
Attachment G - MAC Consultation – 8 January 2024 195

Tables

Table 1-1 Project environmental factors and potential impacts 7
Table 2-1 MS 1180 conditions relating to threatened species and the location in the plan 10
Table 4-1 Threatened terrestrial fauna species identified within 25km buffer (Threatened Fauna Database (DBCA) and APM, 2019) 24
Table 4-2 Threatened marine fauna species identified through desktop assessment. 28
Table 7-1 Fauna habitat types within Project Ceres Clearing Boundary 42
Table 7-2 Threatened and migratory species risk assessment 45
Table 8-1 Environmental Management Strategy for Listed Threatened and Migratory Species 51
Table 14-1 Changes to TSMP 177

Figures

Figure 1-1 Structure of Project Ceres Environmental Management Plan and supporting management-plans. vi

Figure 1-1 Process Block Diagram 2

Figure 1-2 Project Site Layout and Adjoining Facilities..... 4

Figure 4-1 Terrestrial fauna data collection points of Project Ceres area 25

Figure 5-1 Fauna habitats within Project Ceres Clearing Boundary. 33

Figure 11-1 Flow Chart for Environmental Incident Response 167

1 Context, Scope & Rationale

1.1 Proposal Description

Perdaman Chemicals and Fertilisers Pty Ltd (Perdaman) plans 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 (Figure 1-2) (Project Ceres).

Project Ceres infrastructure including the main production facility (urea plant), administration, maintenance and storage infrastructure, conveyor and port storage and ship loading facilities are situated within the Burrup Strategic Industrial Area (Burrup SIA) approximately 20km north-west of Karratha on the Burrup Peninsula. The BSIA has established industrial facilities including Yara Pilbara Fertilisers and Nitrates plants and Woodside's Pluto LNG plant. The estate's proximity to gas, port and other key infrastructure makes it an ideal location for Project Ceres.

The Burrup SIA is 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, Project Ceres will apply effective management strategies that minimise or abate, actual or potential impacts on the environment, heritage and cultural values of the region.

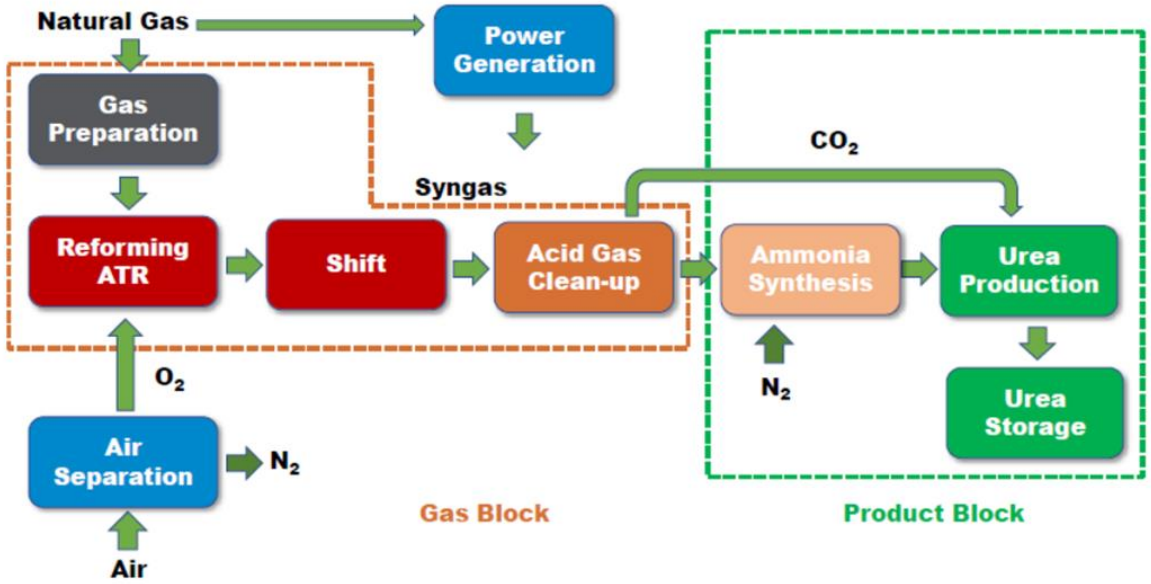
Project Ceres involves piping natural gas from the nearby Woodside operated LNG facility to Project Ceres site under a long term commercial off-take agreement. Natural gas is converted to urea and the final granulated product is transported by conveyor to the Dampier Port by closed conveyor along the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

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 1-1 below.

Figure 1-1 Process Block Diagram



Project Ceres area, including Sites C and F, the causeway, conveyor and Port storage and loading facilities, extends east-west approximately 3.4km covering approximately 105 hectares in area. As illustrated in Figure 1-2 Project Ceres area can be separated into five key areas, as follows:

Site C

Site C is relatively undeveloped with the only visible disturbance being a few access tracks. The site is situated adjacent to the Yara Pilbara Fertilisers ammonia plant to its east, to the north are steep rocky outcrops (P1 Priority Environmental Community (PEC)) 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.

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 the previously disturbed area (now rehabilitated). Drainage from this area flows primarily north into the saline coastal flat.

This area will be used as laydown for equipment and modules, and for shutdown / maintenance activities. The east portion of Site F will be developed to include Project Ceres's administration, maintenance, storage and warehousing facilities.

Causeway

The causeway, which links Sites C and F, extends across the saline coastal flat. The causeway will be built up above the flat and will include several hydrological and fauna friendly culverts to ensure the structure does not impede natural drainage, tidal action or the movement of wildlife.

Conveyor

The 3.5km 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 Fertilisers ammonia pipeline which extends to the bulk liquids jetty adjacent to Project Ceres's Port facilities. Project Ceres'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.

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 ship loader 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.

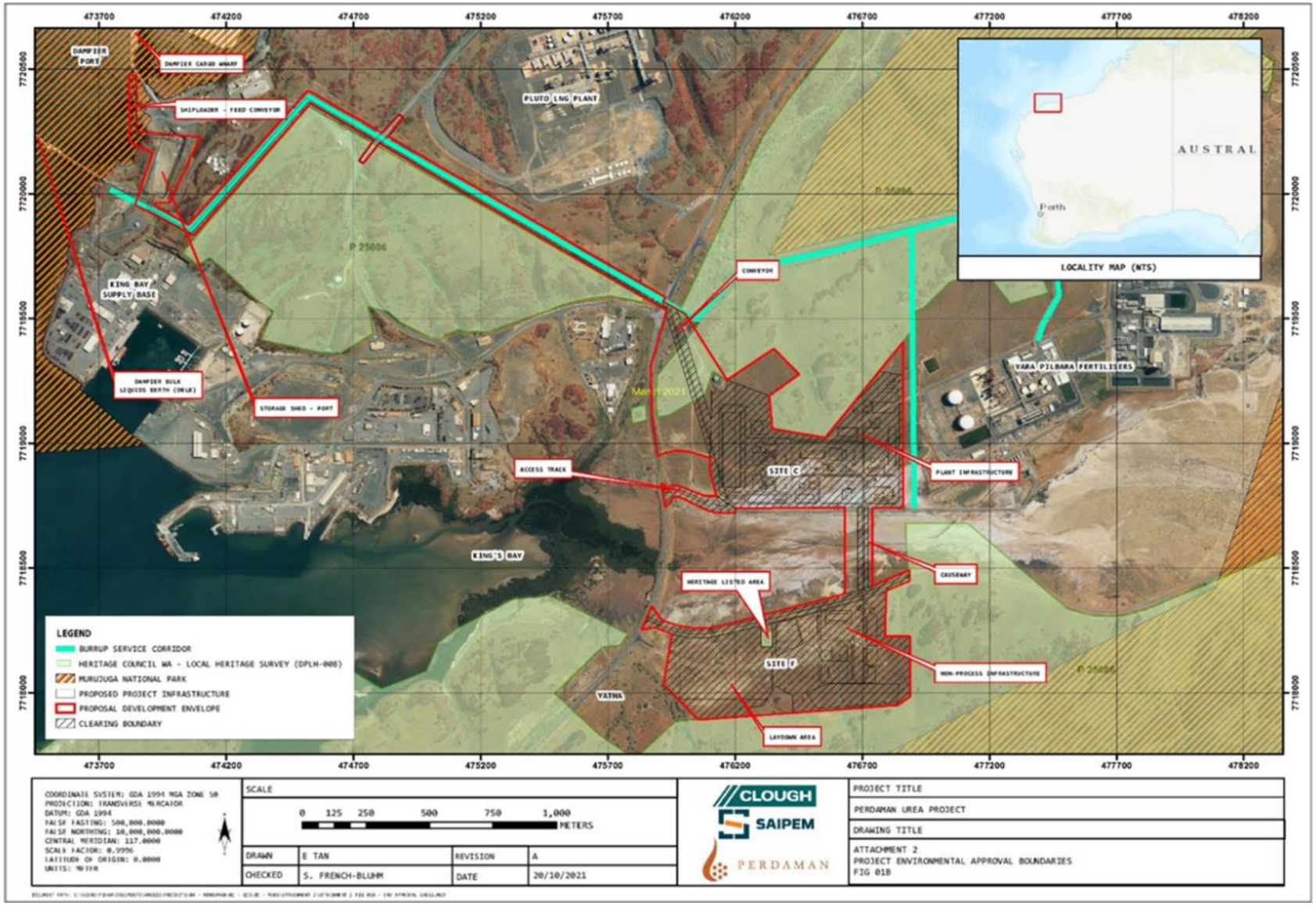


Figure 1-2 Project Site Layout and Adjoining Facilities

1.2 Scope & Requirement of the Plan

Project Ceres's construction and operational activities have the potential to impact listed threatened species under sections 18 and 18A, migratory species under sections 20 and 20A of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and threatened fauna and ecological communities under the Western Australian *Biodiversity Conservation Act 2016* (BC Act).

Biological surveys and a desktop assessment identified a total of 32 threatened fauna species "may", are "likely" or are "known" to occur within a 10km buffer of Project Ceres area. This included 21 terrestrial fauna species, 11 aquatic fauna species, and 9 migratory shorebirds. An additional 43 migratory species may occur in the area that are not listed as threatened. One threatened fauna species, the Ghost Bat (*Macroderma gigas*) and 7 migratory shorebirds were recorded within Project Ceres area (APM, 2019).

It is noted that MS 1180 does not require the development of a specific management plan for the protection of migratory species, however as migratory species are a protected matter under the EPBC Act, they have been included in this TSMP.

The main potential impacts on threatened and migratory species from Project Ceres include the loss of fauna habitat as a result of reduction and/or fragmentation of fauna habitat, injury or death caused by vehicle strike, increase in introduced feral animals and weeds, artificial light pollution, noise, vibration, dust, fire, fauna entrapment, poisoning, debris, spill events, changes to inland water quality, and changes to inland water flows at Project Ceres site.

A suite of strategies and management actions will be implemented throughout the construction and operational phases of Project Ceres to minimise or abate these impacts. Strategies and management actions to protect fauna are detailed in the Confirmed Fauna Management Plan (PCF-PD-EN-FaMP). Additional management actions which contribute to the protection of terrestrial fauna are provided in the following management plans:

- Project Environmental Management Plan (PCF-PD-EN-PEMP)
- Confirmed Flora Management Plan (PCF-PD-EN-FMP)
- Confirmed Surface Water Management Plan (PCF-PD-EN-SWMP)
- Confirmed Light Management Plan (PCF-PD-EN-LMP)
- Pest Management Plan (PCF-PD-EN-PMP)
- Solid & Liquid Waste Management Plan (PCF-PD-EN-SLWMP)
- Weed Management Plan (PCF-PD-EN-WMP)

The purpose of this TSMP is to meet the approval conditions under MS 1180, the EPBC Act, and the BC Act and to provide a framework which describes how Project Ceres will address, manage, monitor and mitigate impacts on threatened terrestrial fauna and migratory species within Project Ceres surrounding areas, and achieve the environmental outcomes and environmental objectives stated in MS 1180, and the objective of the EPBC Act. This plan supplements the PCF-PD-EN-PEMP Project Environmental Management Plan (PEMP).

The strategies in this TSMP establish the key environmental management measures which form Project Ceres's legal requirements. Considering the management and mitigation measures outlined in this TSMP, impacts on threatened terrestrial fauna and migratory species, including abundance, species diversity, geographic distribution and productivity are likely to be minimal and affect habitat that is either widespread in the locality and the region, and/or has been previously disturbed.

In accordance with Condition 5-3 of MS 1180, Threatened Species Management Plan PCF-PD-EN-TSMP-PCF5, prepared in consultation with the Murujuga Aboriginal Corporation (MAC), was provided to the CEO and the Department of Agriculture Water and Environment (DAWE) (now Department of

Climate Change, the Environment, Energy and Water, DCCEEW). The CEO confirmed in writing on 26 February 2022 that the Threatened Species Management Plan submitted under Condition 5-3 (PCF-PD-EN-TSMP-PCF5) satisfied the requirements of Condition 5.

The scope of this TSMP 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 and the urea storage facility. These works are to be managed by the Pilbara Port Authority (PPA) under separate approval and management systems.

This TSMP includes the requirements for management and monitoring of environmental performance against prescribed outcomes and objectives during the construction and operational activities at Site C, Site F, the causeway, the conveyor corridor, Port side storage, transfer and ship loading areas.

This TSMP has been prepared to meet the requirements of the EPA's "***Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plan***" (2021).

This document applies to all phases of Project Ceres including but not limited to, Planning, Design, Construction, Commissioning and Operations.

This document will be periodically updated as new approvals are received and compliance requirements are determined. This document will be updated following construction to apply to updated operational aspects of Project Ceres.

This TSMP has been prepared to meet the Environmental Outcomes as provided in MS 1180, Condition 5-1:

- clearing in the fauna habitat type identified as Rocky Outcrops shall not exceed 0.16 ha;
- clearing in the fauna habitat type identified as Hummock Grasslands on Mid-slopes shall not exceed 49.17 ha;
- clearing in the fauna habitat type identified as Samphire Shrublands / Supratidal flats shall not exceed 11.97 ha; and
- clearing in the fauna habitat type identified as Drainage Lines shall not exceed 2.7ha.

An additional Environmental Outcome as provided in MS 1180, Condition 5-1 is to avoid impacts to short-range endemic fauna species, unless it is demonstrated, and the CEO confirms in writing that the species occurs in a self-sustaining population outside the development envelope. Impacts to short-range endemic fauna species are addressed in the Confirmed Fauna Management Plan (PCF-PD-EN-FaMP).

This TSMP has been prepared to meet the Environmental Objective as provided in MS 1180, Condition 5-2, and the objective of the EPBC Act:

- MS 1180 - minimise direct and indirect impacts to the northern quoll, Pilbara olive python and the ghost bat within the development envelope.
- EPBC Act - to help to protect threatened animals, plants and habitats.

Should there be any contradiction in threatened species-specific requirements between the FaMP and the TSMP, then the TSMP shall take precedence, as it is a Federal approved Plan.

1.3 Responsibility

The responsibility for threatened species, migratory birds and threatened ecological communities management and compliance with this plan sits primarily with Perdaman.

It is the responsibility of the EPC Contractor (Saipem, Clough Joint Venture) (SCJV) and personnel to understand their scope of works and how threatened species, migratory birds and threatened ecological communities management applies to their activities during the construction program.

All personnel undertaking Project activities have the following responsibilities as they relate to threatened species, migratory birds and threatened ecological communities management and Project Ceres's broader environmental requirements:

- Attending a Project Environmental Induction prior to commencing any work on site.
- Ensuring they are aware of Project Ceres's environmental requirements as stipulated in the most current version of the TSMP and Project Environmental Management Plan PCF-PD-PN-PEMP (PEMP) and supporting documents.
- Reporting any environmental hazards, incidents, near misses and community complaints to their supervisor.

Role specific environmental management responsibilities have also been assigned to relevant Perdaman personnel including Project Ceres Director, Project Manager, Environment and Heritage Manager, the Environment Coordinator, Construction Manager and Operations Manager. The specific responsibilities for each of these roles are included in Section 3.

In addition to these Perdaman personnel, Contractors engaged by Perdaman will provide adequate, tertiary qualified (in environmental management or similar qualification) and experienced site-based personnel to coordinate the management of environmental issues relevant to their scope of works.

For specific roles and responsibilities related to threatened species, migratory birds and threatened ecological communities management during the relevant phase of Project Ceres, refer to the PEMP, and the SCJV Construction Environmental Management Plan for responsibilities during the construction phase.

1.4 Key Environmental Factors

Perdaman has identified six key environmental factors that may impact threatened species. The potential impacts of Project Ceres that relate to each of these factors are detailed in Table 1-1. Specific identified risks to threatened species are discussed in Section 7.

Table 1-1 Project environmental factors and potential impacts

Environmental Factor	Potential Impacts
Flora and Vegetation	The proposal could impact on the EPA's environmental objective for flora and vegetation from construction and operation through the: • clearing of 73.05 ha of vegetation within the 106.7 ha development envelope during construction will directly impact on flora and vegetation values • introduction and/or spread of weeds • altered fire regimes • altered surface water and groundwater flow regimes • impacts from emissions from the urea plant. These impacts are mitigated primarily through: limits of development envelope and footprint (Condition 1, MS 1180); implementation of the Confirmed Flora Management Plan (PCF-PD-EN-FMP) (Condition 4, MS 1180); payment of offsets (Condition 11, MS 1180); implementation of a Decommissioning and Rehabilitation Plan (Condition 13, MS 1180); and, implementation of an Air Quality Management Plan (Condition 2, MS 1180).
Terrestrial Fauna	The proposal could impact on the EPA's environmental objective for terrestrial fauna (including listed Migratory/Marine bird species) from construction and operation through: • noise, vibration, and light • removal of breeding, nesting and foraging habitats and the introduction of predators • habitat disturbance and fragmentation of fauna habitats as a result of construction • entrapment, injury or death during construction and operations • inadvertent injury and/or mortality as a result of vehicle strikes form increased traffic during construction and operations • injury and/or mortality as a result of increase waste material during construction

Environmental Factor	Potential Impacts
	and operations • impacts to ghost bat (*Macroderma gigas*), north-western free-tailed bat (*Mormopterus cobourgianus*), northern quoll (*Dasyurus hallucatus*), Pilbara olive python (*Liasis olivaceus barroni*), and migratory bird species. These impacts are mitigated primarily through: limits of development envelope and footprint (Condition 1, MS 1180); implementation of the Confirmed Flora Management Plan (PCF-PD-EN-FMP) (Condition 4, MS 1180); implementation of the Confirmed Fauna Management Plan (PCF-PD-EN-FaMP) (Condition 5, MS 1180); implementation of the Confirmed Threatened Species Management Plan (PCF-PD-EN-TSMP) (Condition 5, MS 1180); payment of offsets (Condition 11,MS 1180); and, implementation of a Decommissioning and Rehabilitation Plan (Condition 13, MS 1180).
Coastal Processes	The proposal could impact on the EPA's environmental objective for coastal processes from construction of the causeway interconnecting Sites C and F: • disruption to tidal water flow movements within the King Bay / Hearson Cove supratidal to intertidal flat area impacting on intertidal and supratidal vegetation and benthic communities, including the King Bay mangrove community. This impact is mitigated through causeway culvert flow velocity limit (Condition 1, MS 1180); and implementation of the causeway design.
Marine Environmental Quality	The proposal could impact on the EPA's environmental objective for marine environmental quality from operation through: • the discharge of saline water (brine) and wastewater into King Bay via the existing Water Corporation Multi-User Brine Return Line (MUBRL) • deposition of air emissions (urea dust from Site C) and spillages of urea product and fugitive urea dust during ship loading and conveying of urea from the storage shed to the ship loader entering the marine environment. These impacts are mitigated primarily through: Limits and extent of the proposal requiring wastewater disposal through the MUBRL (Condition 1, MS 1180); and implementation of a Part V Works Approval and Licence.
Inland Waters	The proposal could impact on the EPA's environmental objective for inland waters (including groundwater, surface water and acid sulfate soils) from construction and operation through: • impacts to surface water quality from stormwater run-off and project infrastructure • impacts to groundwater from potential abstraction • potential impacts to surface water and groundwater as a result of the disturbance of acid sulphate soils These impacts are mitigated primarily through limits of development envelope and footprint (Condition 1, MS 1180); implementation of a Hydrogeological Management Plan if required (Condition 6, MS 1180); implementation of the Confirmed Surface Water Management Plan (PCF-PD-EN-SWMP) (Condition 8, MS 1180); and management of acid sulfate soils in accordance with Condition 7, MS 1180.

2 Legislative Framework

The Perdaman Urea Project sought approvals both under State and Commonwealth legislative frameworks. The three main pieces of legislation that relate to this Project and provide the overall framework for environmental management of threatened species, migratory birds and threatened ecological communities for Project Ceres are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999* – Commonwealth
- *Environmental Protection Act 1986* – State
- *Biodiversity Conservation Act 2016 and Regulations* – State.

This TSMP will be developed and regularly reviewed to comply with the commitments and legal obligations arising from Project Ceres approvals process.

2.1 Environmental Protection and Biodiversity Conservation Act 1999

The Australian Government's key environmental legislation is the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act protects and manages matters of national environmental significance (MNES) which include nationally and internationally important flora, fauna, ecological communities, and heritage places.

Project Ceres was referred to the Commonwealth Department of the Environment and Energy (DoEE) under the EPBC Act on the 21 December 2018 (Reference: 2018/8383) through the s.87 accreditation provisions. The DoEE determined on 28th March 2019 that the Proposed Action was a "Controlled Action" under s.75 of the EPBC Act. The EPBC Act referral 2018/8383 considered the relevant controlling provisions to be National Heritage Places, Listed Threatened Species and Communities; Listed Migratory Species and Commonwealth Marine Species.

On 11 February 2022, the Proposal was provided with an approval decision, as being an approved action subject to conditions. The decision was made under sections 130(1) and 133(1) of the EPBC Act. The **Approved Action** under the decision being; *To construct and operate a urea plant and associated infrastructure on the Burrup Peninsula, Western Australia [See EPBC Act referral 2018/8383, the variation accepted on 26 July 2019 and the variation request accepted on 10 February 2021].* The EPBC approval has effect until the 24 January 2102.

EPBC Act Approval 2018/8383, Condition 2, requires the implementation of the approved Threatened Species Management Plan (PCF-PD-EN-TSMP), or a subsequently revised version prepared in accordance with MS 1180, and approved by the Minister.

2.2 Environmental Protection Act 1986

The *Environmental Protection Act 1986* provides for "the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing".

The Perdaman Urea Project was referred to the Environmental Protection Authority (EPA) under the *Environmental Protection Act 1986* in accordance with Section 38 Part IV. Pursuant to Section 45 of the EP Act, it has been agreed that this proposal may be implemented under the Conditions of Ministerial Statement 1180 (MS 1180), as of the 24 January 2022.

MS 1180 requires Perdaman to meet the following environmental outcomes to protect threatened species, migratory birds and threatened ecological communities for Project Ceres:

Table 2-1 MS 1180 conditions relating to threatened species and the location in the plan

MS 1180 Condition Number	Details	Reference in TSMP
5-1	The proponent shall implement the proposal to meet the following environmental outcomes: (1) Clearing in the fauna habitat type identified as Rocky Outcrops shall not exceed 0.16 ha. (2) Clearing in the fauna habitat type identified as Hummock Grasslands on Mid-slopes shall not exceed 49.17ha. (3) Clearing in the fauna habitat type identified as Samphire Shrublands / Supratidal flats shall not exceed 11.97ha. (4) Clearing in the fauna habitat type identified as Drainage Lines shall not exceed 2.7 ha; and (5) Impacts to short-range endemic fauna species are avoided, unless it is demonstrated, and the CEO confirms in writing that the species occurs in a self-sustaining population outside the development envelope (addressed in the Confirmed Fauna Management Plan PCF-PD-EN-FaMP).	**Clearing** – Section: 3.4, 7 and 8 – Table 8-1 Management Actions
5-2	The proponent shall implement the proposal to achieve the following environmental objective: 1. Minimise direct and indirect impacts to the Northern Quoll, Pilbara Olive Python and the Ghost Bat within the development envelope.	**Section 8** Mitigation and Management Actions – Table 8-1 Management Actions
5-3	At least six months prior to **Ground Disturbing Activities** within the development envelope delineated in Figure 2, or such lesser time approved in writing by the **CEO**, the proponent shall, in consultation with the Murujuga Aboriginal Corporation and **DAWE**, revise and submit to the **CEO** the Fauna Management Plan (PCF-PD-EN-FaMP, Version PCF 1, 12/01/2021) and the Threatened Species Management Plan (PCF-PD-EN-TSMP, PCF 1, 12/01/2021), one or both of which shall: (1) demonstrate how the environmental outcomes in condition 5-1 and environmental objective in condition 5-2 will be achieved. (2) include details of the outcomes of a detailed short-range endemic fauna survey undertaken within the development envelope and surrounding region at least six months prior to **Ground Disturbing Activities**.	**Section 8** Mitigation and Management Actions – Table 8-1 Management Actions **Section 11** – Incident Reporting and management **Section 12** – Environmental Monitoring and Reporting **Section 13** – Threatened Species Management Plan Review

	(3) include provisions to avoid where practicable and otherwise minimise impacts to significant terrestrial fauna species, including short-range endemic fauna and migratory birds, including, but not limited to, impacts from: (a) clearing of habitat. (b) lighting. (c) noise and vibration. (d) dust. (e) vehicle and machinery movement strike. (f) entrapment in trenches or ponds. (g) the attraction of feral animals; and (h) fire. (4) provide for relevant traditional owners to be invited to observe any **Ground Disturbing Activities** and during construction and take reasonable steps to facilitate the observation of those activities by those persons. (5) specify trigger criteria that will trigger the implementation of management and/or contingency actions to prevent direct or indirect impacts to significant terrestrial fauna species, including short-range endemic fauna. (6) specify threshold criteria to demonstrate compliance with conditions 5-1 and 5-2. (7) specify monitoring methodology to determine if trigger criteria and threshold criteria have been met. (8) specify management and/or contingency actions to be implemented if the trigger criteria required by condition 5-3(5) and/or the threshold criteria required by condition 5-3(6) have not been met; and (9) provide the format and timing for the reporting of monitoring results against trigger criteria and threshold criteria to demonstrate that conditions 5-1 and 5-2 have been met over the reporting period in the Compliance Assessment Report required by condition 15-6.	

2.3 Biodiversity Conservation Act 2016

Project Ceres required a Section 40 Authorisation to Take or Disturb Threatened Species under the Western Australian *Biodiversity Conservation Act 2016* (BC Act). Threatened species under the BC Act are species that are critically endangered, endangered or vulnerable.

The Contractor (SCJV) has obtained an Authorisation, Authorisation number TFA 2223-0317, issued on 28 June 2023.

The Authorisation applies to the following species:

- *Pezoporus occidentalis*, Night parrot

- *Dasyurus hallucatus*, Northern quoll
- *Liasis olivaceus barroni*, Pilbara olive python
- *Macroderma gigas*, Ghost bat
- *Macrotis lagotis*, Bilby
- *Rhinonicteris aurantia* (Pilbara form), Pilbara leaf-nosed bat

The Authorisation requires the following:

1) Two (2) weeks prior to clearing, a trapping and relocation program will be undertaken.
2) During clearing and construction activities, the Contractor shall undertake the following actions:
   a) clearing and construction activities will only occur during daylight hours
   b) habitat exclusion zones will be established
   c) clearing will be undertaken progressively in one direction to allow fauna to disperse of their own accord
   d) clearing will be planned to maximise the `area to perimeter' ratio of remnant vegetation
   e) qualified fauna spotters will be present on site during clearing activities
   f) if fauna is spotted on site, fauna spotters will undertake relocation actions:
      i) passive relocation (displacement methods resulting in flushing or shepherding into surrounding vegetation); and
      ii) active relocation (trapping as per authorised taking/disturbance methodology (1)(a) (i-vii).
   g) if fauna is located on site during clearing activities, clearing will cease until fauna have safely vacated or have been relocated
   h) open trenches and excavations will be cleared of trapped fauna by qualified fauna spotters:
      i) clearing of trenches and excavations will occur within three (3) hours of sunrise and immediately prior to commencing any construction via displacement or capture methods; and
      ii) fauna egress points will be installed on all trenches and excavations to prevent risk of fauna entrapment.
   i) structures will be installed to deter fauna from entering water hold ponds
   j) culverts will be installed to prevent the impediment of tidal water flows within the King Bay/Hearson Cove supratidal to intertidal flat area
   k) microhabitat for fauna will be protected and maintained:
      i) rock piles will not be disturbed between early November to late April to minimise impacts to Pilbara olive pythons
      ii) clearing of rocky boulder habitat that may contain suitable refuge for Pilbara olive pythons will be avoided
      iii) large boulders will be grouped as conglomerates around the periphery of retaining batters to offer potential cave and crevice habitat for Pilbara olive pythons
      iv) impacts on the creek line in the southwest of Site F will be avoided
      v) disturbance to rock piles on the upper slopes of valleys will be avoided to minimise impacts to northern quoll denning habitat; and
      vi) access to potential northern quoll denning sites will be restricted.
   l) all fencing, including temporary fencing, will exclude the use of barbed wire, and
   m) traffic management, including the establishment and enforcement of speed limits in the development envelope, will be conducted in accordance with relevant Management Plans.
3) Following clearing and construction activities, Perdaman will undertake the following actions:
   a) Management of onsite waste and chemicals will be conducted in accordance with relevant

management plans.

b) Develop and implement hygiene measures to limit the spread of weeds and ensure that feral predators are not attracted to the facility; and

c) develop and implement a feral fauna control program.

In accordance with the Authorisation, all threatened fauna injuries, unexpected deaths, unplanned euthanasia, and abandoned young or eggs, must be reported to the DBCA Wildlife Protection Branch, Wildlife Licensing Section (wildlifelicensing@dbca.wa.gov.au) to notify of the incident and for advice on treatment or disposal. All deceased threatened fauna must be offered to the Western Australian Museum.

The Contractor must record the following details for activities done pursuant to the Authorisation and provide this information to the Species and Communities Program (SpeciesandCommunities@dbca.wa.gov.au) prior to the end of each annual period of the Authorisation (from the date signed by the Minister's delegate).

2.3.1 Proposed Changes to Authorisation number TFA 2223-0317

Perdaman proposed to seek the following amendment to Authorisation number TFA 2223-0317:

The Authorisation applies to the following species:

- *Pezoporus occidentalis, Night parrot*
- *Dasyurus hallucatus, Northern quoll*
- *Liasis olivaceus barroni, Pilbara olive python*
- *Macroderma gigas, Ghost bat*
- *Macrotis lagotis, Bilby*
- *Rhinonicteris aurantia (Pilbara form), Pilbara leaf-nosed bat*

The Authorisation requires the following:

4) Two (2) weeks prior to clearing, a trapping and relocation program will be undertaken.

5) During clearing and construction activities, the Contractor shall undertake the following actions:

a) habitat exclusion zones will be established

b) clearing will be undertaken progressively in one direction to allow fauna to disperse of their own accord

c) clearing will be planned to maximise the `area to perimeter' ratio of remnant vegetation

d) qualified fauna spotters will be present on site during clearing activities

e) if fauna is spotted on site, fauna spotters will undertake relocation actions:

i) passive relocation (displacement methods resulting in flushing or shepherding into surrounding vegetation); and

ii) active relocation (trapping as per authorised taking/disturbance methodology (1)(a) (i-vii).

f) if fauna is located on site during clearing activities, clearing will cease until fauna have safely vacated or have been relocated

g) open trenches and excavations will be cleared of trapped fauna by qualified fauna spotters:

i) clearing of trenches and excavations will occur within three (3) hours of sunrise and immediately prior to commencing any construction via displacement or capture methods; and

ii) fauna egress points will be installed on all trenches and excavations to prevent risk of fauna entrapment.

h) structures will be installed to deter fauna from entering water hold ponds

i) culverts will be installed to prevent the impediment of tidal water flows within the King Bay/Hearson

Cove supratidal to intertidal flat area

j) microhabitat for fauna will be protected and maintained:

i) rock piles will not be disturbed between early November to late April to minimise impacts to Pilbara olive pythons

ii) clearing of rocky boulder habitat that may contain suitable refuge for Pilbara olive pythons will be avoided

iii) large boulders will be grouped as conglomerates around the periphery of retaining batters to offer potential cave and crevice habitat for Pilbara olive pythons

iv) impacts on the creek line in the southwest of Site F will be avoided

v) disturbance to rock piles on the upper slopes of valleys will be avoided to minimise impacts to northern quoll denning habitat; and

vi) access to potential northern quoll denning sites will be restricted.

k) all fencing, including temporary fencing, will exclude the use of barbed wire, and

l) traffic management, including the establishment and enforcement of speed limits in the development envelope, will be conducted in accordance with relevant Management Plans.

6) Following clearing and construction activities, Perdaman will undertake the following actions:

a) Management of onsite waste and chemicals will be conducted in accordance with relevant management plans.

b) Develop and implement hygiene measures to limit the spread of weeds and ensure that feral predators are not attracted to the facility; and

c) develop and implement a feral fauna control program.

The Authorisation requires that the Authorisation Holder must undertake the Authorised Activity, including any mitigation measures, as specified in the signed application dated 22 March 2023, *Environmental Protection Act 1986* conditions of approval outlined in MS 1180, *Environmental Protection and Biodiversity Conservation Act 1999* conditions of approval outlined in EPBC 2018/8383, and all approved Management Plans associated with the Perdaman urea plant project including subsequent edited and approved versions, unless otherwise authorised.

This TSMP, as an approved Management Plan, has been revised to consider the impacts of night works on threatened species and includes additional mitigation strategies to allow night works to occur during the construction and commissioning phases of the Project.

Changes to relevant Management Actions are in this TSMP (Table 8-1) for the purpose of seeking approval from the Minister under Condition 23 of EPBC Approval 2018/8383, consistent with the requirements of section 143A of the EPBC Act. This TSMP is also submitted to the Department of Biodiversity, Conservation and Attractions for review by the Minister under the BC Act to facilitate the amendment to the Authorisation TFA 2223-0317.

2.4 Biodiversity Conservation Regulations 2018

Under the *Biodiversity Conservation Act 2016* (BC Act) 'Fauna' means any animal native to Australia, and any animal that periodically migrates to and lives in Australia and includes any animal declared to be fauna by the Department of Biodiversity, Conservation and Attractions.

During Project construction and normal plant operations, relocation of fauna may be required as part of any clearing or grubbing works, and where fauna could enter a work area/trench and needs to be safely removed and relocated to a suitable location outside Project Ceres's battery limits.

In accordance with Regulation 28 of the Biodiversity Conservation Regulations 2018, the Contractor requires a Taking Fauna (Relocation) Licence to take, disturb, possess, transport and/or release fauna for relocation.

The Contractor has obtained a Taking Fauna (Relocation) Licence, Licence Number FR28000358

(issued by Department of Biodiversity, Conservation and Attractions on 29 June 2023), which allows the following:

- Take and disturb fauna using hand capture techniques (Hook & Bag) as part of the Perdaman Urea Plant construction (approved under Ministerial Statement 1180) including the establishment of a boundary fence, trenches, clearing and grubbing and the construction of roadways. Fauna may become entrapped and require relocation to alternative areas.
- Relocate (transport and release) captured fauna will be released as soon as possible after capture into nearby suitable habitat outside of the construction envelope.

The licence prohibits:

- The release of any fauna in any area where it does not naturally occur.
- The transfer fauna to any other person or authority unless approved in writing by the CEO, or
- The disposal of the remains of fauna in any manner likely to confuse the natural or present-day distribution of the species.

2.5 Policy and Guidance

To ensure compliance with EPA guidelines for project approval, the following policies and guidance have been considered when developing this TSMP:

- Commonwealth of Australia (1996), The National Strategy for the Conservation of Australia's Biological Diversity.
- Department of the Environment (2015), Conservation Advice *Calidris ferruginea* curlew sandpiper. Canberra: Available from: http://www.environment.qov.au/biodiversity/threatened/species/pubs/856-conservationadvice.pdf.
- Department of the Environment (2015), Conservation Advice *Numenius madagascariensis* eastern curlew. Canberra. Available from: http://www.environment.gov.au/biodversity/threatened/species/pubs/847conservation-advice.pdf.
- Department of the Environment (2015), Wildlife Conservation Plan for Migratory Shorebirds. Canberra, ACT. Available from: http://www.environmert.qov.au/biodiversity/publications/wildlife-conservation-plan-miqratoryshorebirds- 2016.
- Department of the Environment (2015), Threat abatement plan for predation by feral cats. Canberra. Available from: http://www.environmentAov.au/biodiversity/threatened/publications/tap/threat-abatement-planferal-cats.
- Department of the Environment and Energy (2017), Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species.
- DoEE (2020), Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Canberra.
- Department of Environment and Energy, Water (2017), Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*). Canberra.
- Department of Environment and Energy (2017), Recovery Plan for Marine Turtles in Australia.
- Department of the Environment and Heritage (2001), National Objectives and Targets for Biodiversity Conservation 2001-2005.
- Department of the Environment, Water, Heritage and the Arts (2008), Approved Conservation Advice for *Liasis olivaceus barroni* (Olive Python - Pilbara subspecies). Canberra. Available from: http://www.environment.qov.au/biodiversity/threatened/species/pubsj66699-conservation-advice.pdf.
- DEWHA (2008), Threat abatement plan for predation by the European red fox. Canberra. Available from:http://www.environment.qov.au/biodiversity/threatened/publications/tap/predation-european-red-fox.
- DEWHA (2009), Significant impact guidelines for 36 migratory shorebirds species (EPBC Act Policy

Statement 3.21.

- DEWHA (2010), Survey Guidelines for Australia's Threatened Bats.
- DEWHA (2011), Survey Guidelines for Australia's Threatened Reptiles.
- Department of Sustainability, Environment, Water, Population and Communities (2011), Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads. Canberra. Available from: http://www.environment.gov.au/resource/threat-abatement-plan-biolcqical-effects-includinq-lethal- toxic-ingestion-caused-cane-toads
- DSEWPaC (2012), Marine bioregional plan for the North-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional-plans/north-west.
- EPA (2016), Environmental Factor Guideline: Terrestrial Fauna.
- EPA (2016), Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016.
- EPA (2016), Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna.
- EPA (2016), Technical Guidance: Sampling of short-range endemic invertebrate fauna.
- EPA (2016), Technical Guidance: Terrestrial Fauna Survey.
- EPA (2018), Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual.
- EPA (2018), Statement of Environmental Principles, Factors and Objectives.
- Government of Western Australia (2011), Environmental Offsets Policy.
- Government of Western Australia (2014), Environmental Offsets Guidelines.
- Hill, B.M. & S.J. Ward (2010), National Recovery Plan for the Northern Quoll *Dasyurus hallucatus*. Darwin. Available from: http://www.environment.gcv.au/resource/nationalrecovery-plan-northern-quoll-dasyurus-hallucatus.
- Threatened Species Scientific Committee (2005), Commonwealth Listing Advice on Northern Quoll (*Dasyurus hallucatus*). Available from: http://www.environment.gov.au/biodiversity/threatened/species/dasyurus-hallucatus.html.
- Threatened Species Scientific Committee (2009), Conservation Advice *Dermochelys coriacea* Leatherback turtle. Canberra.
- Threatened Species Scientific Committee (2011), Conservation Advice *Sternula nereis nereis* Australian fairy tern. Canberra.
- Threatened Species Scientific Committee (2016), Conservation Advice *Calidris canutus* Red knot. Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservationadvice- 05052016.pdf.
- Threatened Species Scientific Committee (2016), Conservation Advice *Celidris tenuirostriss* Great knot. Canberra. Available from: http://www.environment.gov.au/biodversity/threatened/species/pubs/862conservation-advice-05052016.pdf.
- Threatened Species Scientific Committee (2016), Conservation Advice *Charadrius mongolus* Lesser sand plover. Canberra.
- Threatened Species Scientific Committee (2016), Conservation Advice *Limosa lapponica baueri* Bar-tailed Godwit. Canberra.
- Threatened Species Scientific Committee (2016), Conservation Advice *Macroderma gigas* ghost bat. Canberra Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/174conservation-advice-05052016. pdf

3 Roles and Responsibilities

Role specific environmental responsibilities for the Perdaman Project team are outlined below.

3.1 Project Director

Project Ceres Director will be responsible for and will have the authority to:

- Provide environmental leadership and ensure adequate resources are provided to effectively implement this plan.
- Be an emergency contact for Project Ceres and provide required information to the Perdaman Board of Directors; and
- Endorse and support the Environment Policy and this plan.

3.2 Manager

Project Ceres Manager is accountable for implementation of this plan on site. Responsibilities include:

- Ensuring that the requirements of this plan are implemented, maintained and communicated.
- Provide environmental leadership and ensure adequate resources are provided to effectively implement this plan.
- Participate in investigation of incidents and non-conformances and reviews of this plan; and
- Ensure work is planned and executed in compliance with environmental requirements.

3.3 Environment and Heritage Manager

The Environment and Heritage Manager is a site based Environmental Representative who has the authority and responsibility for reporting the implementation, compliance and effectiveness of this plan to the Management Team. The Environment and Heritage Manager will:

- Be an emergency contact and available to be contacted by Perdaman's other senior representatives.
- Communicate the requirements of this plan to site personnel.
- Provide documentation and support to managers and supervisors.
- Ensure project inductions are undertaken as per this plan.
- Managing Project Ceres's environment and heritage monitoring programs.
- Review and monitor corrective and preventative actions resulting from audits, incidents and non-conformances.
- Ensure identified risks are analysed and evaluated according to agreed criteria. Regularly review identified risks and controls and maintain a risk register.
- Oversee the implementation and management of the GDP process.
- Ensure regular inspections, observations, monitoring and audits are conducted to check the effectiveness of controls and that compliance is maintained.
- Review Project performance and compliance with site environmental and heritage requirements.
- Lead investigation and reporting of environmental and heritage incidents, non-conformances and response to community complaints.
- Inform external stakeholders of any relevant non-conformances, environmental and heritage incidents or public complaints and assist with regulator liaison, if required.
- Identify and implement corrective and preventative actions after incidents and share lessons learned within Project Ceres team.
- Manage the submission and attainment of environmental and heritage approvals.
- Prepare a monthly Project environment and heritage report, presenting an update on key performance

indicators, project outcomes, issues and incidents.

- Oversee review of existing and preparation of additional environmental management documentation, as required.
- Assure all Project activities are in accordance with statutory, approval and Project environmental and heritage requirements; and
- Attend and participate in regular Project meetings.

3.4 Environment Coordinator

The Environment Coordinator is a site based Environmental Representative of Perdaman responsible for:

- Coordination of the GDP process on site including preparing GDPs in consultation with the relevant Managers, issuing and releasing GDPs, verifying clearing boundaries, monitoring clearing works, and closing out GDP permits.
- Presenting Project environmental inductions to Project Personnel.
- Conducting regular inspections and audits in accordance with this plan.
- Consolidating emissions, consumption and monitoring data into a Monthly Environmental Report.
- Verifying rehabilitation works have been completed in accordance with the Rehabilitation Management Protocol.
- Providing environmental advice and information to Project Ceres management team.
- Supporting the Environment and Heritage Manager with environmental incident investigations.
- Providing advice to the Environment and Heritage Manager about implementing, maintaining and reviewing this plan and associated documents; and
- Fulfilling the responsibilities of the Environment and Heritage Manager when they are on leave from site.

3.5 Construction Manager

- The Construction Manager is accountable for implementation of this plan on site during Project Ceres's construction phase. Their responsibilities include:
- Planning construction Works in a manner that avoids or minimises impact to environment in line with this plan.
- Ensuring a GDP application is submitted, and a GDP Permit is issued in a timely manner prior to the commencement of any ground disturbing works or activities being undertaken.
- Ensuring any ground disturbing works or activities undertaken are within the limits specified in the Works specific GDP.
- Providing environmental leadership and ensuring adequate resources are allocated to effectively implement this plan.
- Stopping all work immediately if an unacceptable impact on the environment is likely to or has occurred.
- Ensuring that the appropriate level of induction and training has been provided to all site staff to minimise environmental impacts from Project works.
- Participate in investigations relating to construction related incidents resulting in breaches of environmental regulatory, licence or approval requirements; and
- Regularly liaise with the Environment and Heritage Manager regarding environmental aspects and impacts.

3.6 Operations Manager

The Operations Manager is responsible for the implementation of this plan during the construction

and operational phases of Project Ceres, including:

- Planning the commissioning and ongoing facility operations in a manner that avoids or minimises impact to environment in line with this plan.
- Providing environmental leadership and ensuring adequate resources are allocated to effectively implement this plan immediately if an unacceptable impact on the environment is likely to or has occurred.
- Ensuring that the appropriate level of training has been provided to all site staff to minimise environmental impacts of Project Ceres's commissioning activities and ongoing facility operations.
- Participate in investigations relating to construction related incidents resulting in breaches of environmental regulatory, license or approval requirements; and
- Regularly liaise with the Environment and Heritage Manager regarding environmental aspects and impacts. In addition to these Perdaman personnel, Contractors engaged by Perdaman will provide adequate, tertiary qualified (in environmental management or similar qualification) and experienced site-based personnel to coordinate the management of environmental issues relevant to their scope of works.

.

4 Rationale & Approach

4.1 Study and Survey Findings

Pendoley Environmental Pty Ltd (Pendoley) were engaged to undertake a Marine Fauna Desktop Assessment (Pendoley, 2019) to identify potentially impacted marine fauna, quantify the likely direct, indirect and cumulative impacts and advise on appropriate mitigations. The full report is provided in **Attachment A**. A summary of the desktop assessment and impacts is provided in Section 4.4.

The objectives of the Pendoley (2019) desktop study and report were:

- Describe the marine fauna likely to be impacted by the Perdaman Urea Project, including identification of critical habitat and ecological windows for affected species.
- Assess the values and significance of marine fauna likely to be impacted by the Perdaman Urea Project in both a local and regional context.
- Quantify the likely direct, indirect and cumulative impacts to marine fauna in terms of the extent, duration and severity.
- Advise on proposed mitigation measures and monitoring strategies to avoid and/or minimise impacts on marine fauna.
- Advise on appropriate offsets in case residual impacts cannot be avoided reduced, mitigated or subsequently restored.

Locations considered in scope of the marine fauna desktop study include the Development Envelope, coastal waters of the Dampier Archipelago and any regional island rookery assessed as at-risk.

Animal Plant Mineral (APM) was engaged to carry out desktop and field surveys of terrestrial flora and fauna.

The aims of the desktop survey were to:

- Establish the fauna assemblage previously determined for the site and the region.
- Identify species previously determined as present on site including Threatened and Priority Fauna under the provisions of the BC Act and EPBC Act).
- Identify species previously determined as present on site regarded as being “significant” at both local and regional scales.
- Identify habitat types previously determined as present on site regarded as being “significant” at both local and regional scales; and
- Identify introduced species previously determined as present on site.

The desktop study included database searches, including:

- Australian Government Protected Matters Search Tool (DCCEEW)
- Atlas of Living Australia
- NatureMap (DBCA)
- Threatened Fauna Database (DBCA)
- Review of existing fauna surveys and investigations within the Burrup Peninsula and Surrounds Relevant to Project Ceres.

The APM (2019) terrestrial vertebrate fauna survey was conducted in two discrete periods, the initial, pre-wet season Level 1 survey, and the follow-up, post-wet season Level 2 survey. The initial survey occurred between 19 and 22 of November 2018.

Fauna habitats were surveyed using nine survey points, distributed throughout the site and sampling the range of habitats present. At each survey point, a range of substrate, landform, vegetation, and structural parameters were measured. Any fauna sighted during recording at these points was recorded. Some areas adjacent to Project Ceres Area that represented unique or significant habitat values were also surveyed. Morning and evening bird surveys were conducted, and camera traps and bat detectors were deployed in habitat appropriate for Threatened fauna. Spotlight surveys were also conducted each evening.

The post-wet season Level 2 survey was carried out between 27 March and 5 April 2019. This survey consisted of the deployment of six trap sites across the habitats available within the site, including cage traps, aluminium box traps, pitfall traps, funnel traps, camera traps, and acoustic bat recorders. In addition, morning and afternoon bird surveys and nocturnal spotlight surveys were conducted.

Bird surveys were conducted during the November 2018 and March 2019 survey periods. Bird surveys were conducted in the morning, immediately after sunrise, and in the evening, just prior to sunset. The method involves searching 2 ha plots for 20 minutes and recording each species (and the number of individuals). Around 8-12 plots were searched each day. Plots were spread throughout all habitat types present at the site, with a focus on the floodplain and fringing habitat in order to sample migratory wader or shorebird species. All bird surveys were conducted in accordance with EPBC Act *Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE, 2017)

The aims of the field survey were to:

- Survey the species assemblage present at the site,
- Identify the fauna habitat values present at the site,
- Identify habitat that may be suitable for Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act),
- Assess the likelihood of occurrence of Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act),
- Assess the likelihood of occurrence of species that are regarded as being “significant” at both local and regional scales, and
- Assess the habitat suitability and likelihood of occurrence of introduced species.

APM’s post-wet season field surveys followed the passage of Cyclone Veronica which crossed Karratha in March2019. 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-wetseason survey conditions.

The Perdaman Urea Project – Pre and Post-wet season Biological Survey (APM,2019) is included in **Attachment B.**

4.1.1 Technical Memorandum – Assessment of Proposed Changes to Management Actions

In December 2023, Perdaman engaged a Senior Ecologist at GHD to assess the potential impacts to threatened and priority species from a proposed amendment to Management Actions provided in this TSMP, and the BC Act approval conditions with specific regard to the removal for the requirement to idle machinery for 30 minutes prior to work and the allowance of construction works during nighttime hours. The Technical Memorandum is provided as Attachment C – GHD Technical Memorandum, December 2023.

GHD (2023) conducted a review of the relevant information provided in relation to the project, including:

- Perdaman Urea Project Pre and Post-Wet Season Biological Survey, APM, 2019
- Fauna Management Plan, PCF-PD-EN-FaMP
- Threatened Species Management Plan, PCF-PD-EN-TSMP

GHD also conducted a fauna trapping and translocation program in September 2023 across the project area, the results of which were also used to inform the assessment. Based on the information available, the likelihood of occurrence was determined for each of the threatened species considered under the S40 approval. GHD then considered the potential impacts of the proposed amendments on those species considered as possible or likely to occur within the project area. The potential for impact was given an overall risk grade.

GHD has assessed the potential risk to 13 threatened and priority fauna species resulting from the proposal to amend the approval conditions for Project Ceres to allow for night works to be conducted

and the removal of a machine idling condition. Of the 13 species assessed, a residual risk rating of low and subsequently negligible (after the adoption of recommended mitigation measures), was allocated to nine species. An initial risk rating of moderate was allocated to four species and after the adoption of mitigation measures this rating was reduced to low. Overall, the proposed amendments present a low risk of potential impacts to the assessed species at a species level. It is GHD's recommendation that the mitigation measures outlined in this document are adopted before the conditions are amended.

4.2 Terrestrial Vertebrate Fauna

4.2.1 Desktop Assessment

Across the four online database searches (AoLA, NatureMap, DBCA, and the EPBC PMST), 214 terrestrial vertebrate fauna were identified as having the potential to occur, including 4 amphibians, 123 birds, 23 mammals, and 64 reptiles. The most extensive species list was the NatureMap database, with 146 species, followed by the AoLA database with 120. The DBCA Database and PMST databases both identified 42 species.

APM (2019) notes that a review of previous biological surveys has been carried out in the immediate vicinity and combined them in one collated database containing 305 species, including 14 non-volant mammals, 18 bats, 4 introduced mammals, 186 birds, 79 reptiles and 4 amphibians. Of these, 221 species were recorded in field surveys, providing an extensive species list, especially with additional online database searches conducted by APM for this study.

In total, 99 conservation significant species were identified across all database searches (**Attachment 1,** Table 5-1). Of these, 98 were from database searches previous reports, and one additional species was recorded during APM surveys that had not been recorded previously. For simplicity, all conservation significant fauna recorded during the APM (2019) surveys are also included in **Attachment 1,** Table 5-1, but are discussed in more detail in the following section. **Attachment 1**, Appendix H, provides a discussion of the likelihood of occurrence of each of the identified conservation significant fauna and their habitat descriptions and requirements. **Attachment 1**, Figure 5-1 shows the locations of conservation significant fauna in the vicinity of the Study Area identified by a DBCA database search.

Of the 99 conservation significant species that have been recorded, or have the potential to occur, 88 are birds, many of which are listed as migratory or marine under the EPBC Act. A range of threatened species also have the potential to occur. The Curlew Sandpiper (*Calidris ferruginea*), Great Knot (*Calidris tenuirostris*), and Eastern Curlew (*Numenius madagascariensis*) are all listed as Critically Endangered and have been recorded in previous surveys at neighbouring sites. The Northern Quoll (*Dasyurus hallucatus*) and the Black-footed rock wallaby (*Petrogale lateralis*) are both listed as Endangered and have been recorded in previous surveys in the vicinity. The Pilbara Olive Python (*Liasis olivaceus barroni*) and Ghost Bat (*Macroderma gigas*) are listed as Vulnerable, and while records exist for both species in the database searches, they were not recorded in previous surveys.

4.2.2 Field Survey

APM (2019) recorded 15 mammal species over the two surveys: 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 (*Psuedomys. desertor*) (recorded in the 2019 APM survey, but has not been recorded in either database searches, or during previous surveys). A range of naturalised (i.e. Dingo/dog, *Canis familiaris*) and introduced (i.e. Feral cat, and Black rat), were also recorded. The Northern Quoll (*Dasyurus hallucatus*) and the Black-footed rock wallaby (*Petrogale lateralis*) are both listed as Endangered and have been recorded in previous surveys in the vicinity however were not observed during the APM (2019) survey.

A total of 8 bat species were recorded during the APM (2019) survey. The Ghost Bat (*Macroderma gigas*) was recorded using acoustic bat detectors on two occasions during the post wet season survey, in mid-slope, rocky outcrop and samphire shrublands habitats. It is listed as Vulnerable under both

Commonwealth 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 Project Ceres Area. The drainage line in the south-west ofProject Ceres Area provides suitable foraging habitat for this species. This area has been excised from Project Ceres Development Envelope and will not be impacted. One of the recommendations of the confidential heritage survey report to JTSI covering Project Ceres, which was endorsed by Murujuga Aboriginal Corporation (MAC) and the Circle of Elders, is to excise the ceremonial site (the "Yatha") in the south-west corner of Site F from Perdaman's Development Envelope. Perdaman has subsequently agreed to this recommendation, which in turn has provided further protection of drainage line habitat in this area. The realignment of Hearson Cove Road to the north of Site F has also protected this area.

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 during previous surveys. 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 (APM, 2019). 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 creek lines 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. 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. 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.

Twenty-eight species of reptiles and amphibians were recorded by APM (2019), all of which during the post wet season trapping survey, despite the low diversity and density of amphibians on the Burrup Peninsula (likely due to the absence of permanent fresh water). No conservation significant reptiles or amphibians were identified during the surveys.

The threatened terrestrial fauna identified within 25km buffer (through desk top assessment and field surveys) of Project Ceres area is shown in Table 4-1.

The APM (2019) fauna survey locations are presented in Figure 4-1.

Table 4-1 Threatened terrestrial fauna species identified within 25km buffer (Threatened Fauna Database (DBCA) and APM, 2019)

Species	Common Name	EPBC Status	BC Act Status	Type of Presence
Mammals				
Dasyurus hallucatus	Northern Quoll	E	E	Species or species habitat known to occur within area (detected during previous field surveys)
Hydromys chrysogaster	Water-Rat	-	P4	Species or species habitat known to occur within area (detected during previous field surveys)
Macroderma gigas	Ghost Bat	V	V	Species or species habitat known to occur within area (detected during field surveys (APM, 2019))
Macrotis lagotis	Greater Bilby	V	V	Species or species habitat likely to occur within area
Mormopterus cobourgianus	Northern Coastal Free-tailed Bat	-	P1	Species or species habitat known to occur within area (detected during field surveys (APM, 2019))
Osphranter robustus	Euro	V	-	Species or species habitat known to occur within area (detected during field surveys (APM, 2019))
Petrogale lateralis	Rock Wallaby	E	-	Species or species habitat known to occur within area (detected during previous field surveys)
Pseudomys chapmani	Western Pebble-mound Mouse	-	P4	Species or species habitat likely to occur within area
Rhinonicteris chapmani	Pilbara Leaf-Nosed Bat	V	P4	Breeding known to occur within area
Reptiles				
Liasis olivaceus barroni	Pilbara Olive Python	V	V	Species or species habitat likely to occur within area
Notoscincus butleri	Lined-soil Crevice Skink (Dampier)	-	P4	Species or species habitat likely to occur within area

Where E = Endangered, V = Vulnerable, CR = Critically Endangered, P1 = Priority 1 and P4 = Priority 4

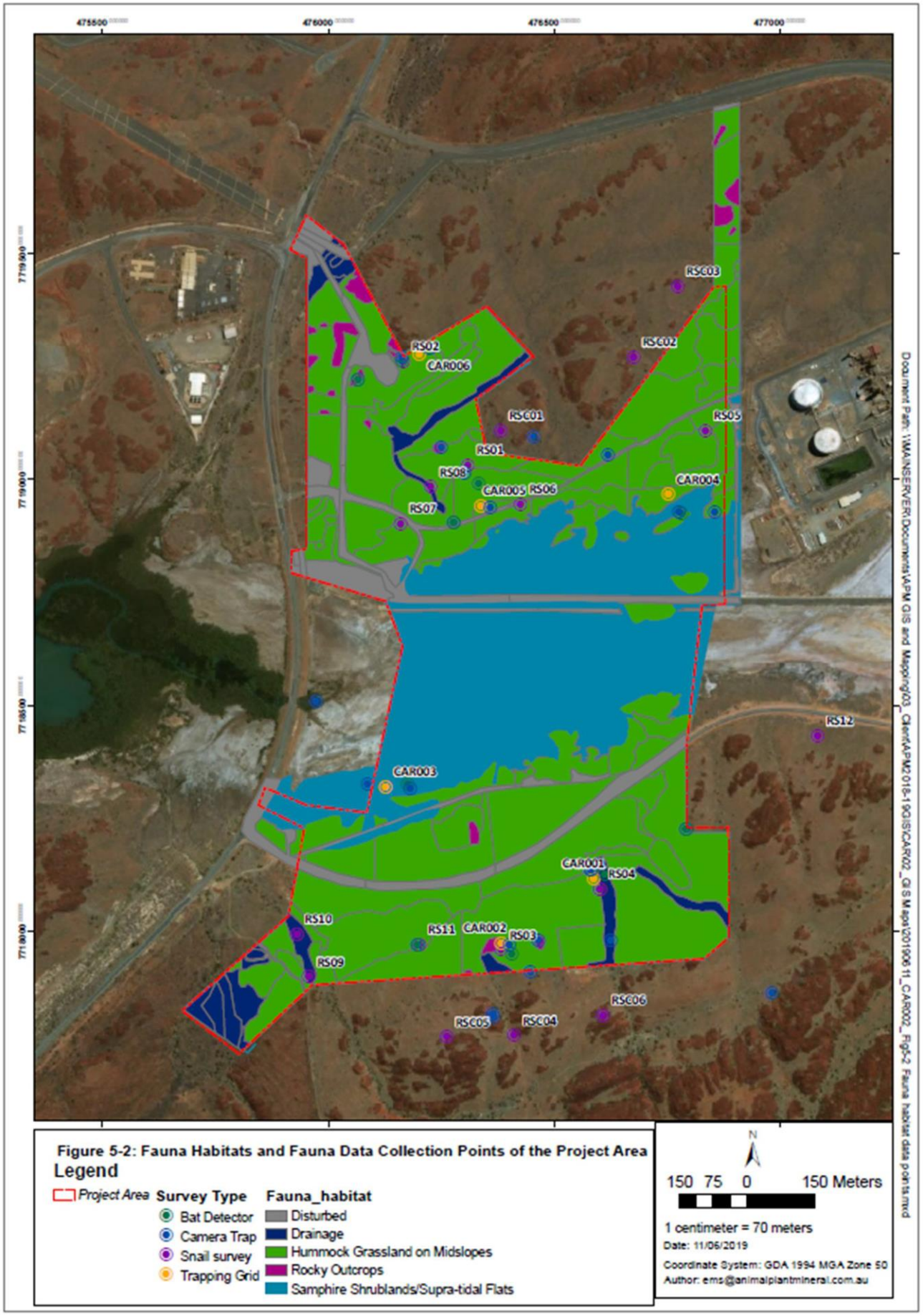


Figure 4-1 Terrestrial fauna data collection points of Project Ceres area

4.3 Avifauna / Migratory Birds

4.3.1 Desktop Assessment

Section 0 provides the outcomes of the online database searches (AoLA, NatureMap, DBCA, and the EPBC PMST) and the review of previous biological surveys for bird species. A total of 123 birds were identified during the online searches and 186 birds were identified in field surveys, providing an extensive species list.

In total, 99 conservation significant species were identified across all database searches (**Attachment 1,** Table 5-1). Of the 99 conservation significant species that have been recorded, or have the potential to occur, 88 are birds, many of which are listed as migratory or marine under the EPBC Act. **Attachment 1**, Appendix H, provides a discussion of the likelihood of occurrence of each of the identified conservation significant bird species including migratory birds and their habitat descriptions and requirements. **Attachment 1**, Figure 5-1 shows the locations of conservation significant fauna in the vicinity of the Study Area identified by a DBCA database search.

A range of threatened species also have the potential to occur. The Curlew Sandpiper (*Calidris ferruginea*), Great Knot (*Calidris tenuirostris*), and Eastern Curlew (*Numenius madagascariensis*) are all listed as Critically Endangered and have been recorded in previous surveys at neighbouring sites.

4.3.2 Field Survey

APM recorded 63 bird species across the pre-wet and post-wet season surveys (**Attachment 1**, Table 5-3). In total, 150 bird species have been recorded on the Burrup Peninsula in surveys conducted in 1994, 1998, 2002, 2005 and the two surveys by APM (NB: the total of 186 bird species noted in section 5.1 included records off the Burrup Peninsula but in similar habitat) (APM, 2019). 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 (APM, 2019).

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*) (APM, 2019).

Of the 26 conservation significant species observed by APM during both surveys (APM, 2019), 23 are listed as Marine and 7 are listed as Migratory (a species can be listed as both Marine and Migratory) and are covered under international agreements. The Grey-tailed Tattler (*Tringa brevipes*) is listed as Priority 4 under the BC Act, which means it is Rare or Near Threatened, but not qualifying of listing as Threatened (APM, 2019).

The Study Area contains a broad salt plain, draining westwards towards King Bay, with some associated Mangrove vegetation outside the Study Area. As a result, the Study Area provides an important and relatively limited area suitable for migratory waders and shorebirds. Under the guidelines outlined by DoEE (2017), the area does not qualify as Nationally Important Habitat, as there are fewer than 15 migratory species, and less than 2,000 migratory shorebirds that regularly use the area. The Burrup Road, a busy road providing access to the many processing facilities and Port, is situated immediately to the west of the supra-tidal flats. As a result, this area is already subject to noise disturbance from traffic, and the species observed during APM surveys are present despite this disturbance. While further disturbance to this area should be minimised, it is unlikely to present a

significant increase to that already created by the Burrup Road (APM, 2019).

The waters of the Dampier Archipelago may provide foraging habitat during nonbreeding periods or for juvenile birds yet to reach sexual maturation. The proximity of the sites to beaches and mangroves suggests that migratory sea birds and shorebirds may also be seasonally present within Project Ceres area, or in the adjacent areas. The Burrup Road, a busy road providing access to the many processing facilities and Port, is situated immediately to the west of the supra-tidal flats. As a result, this area is already subject to noise disturbance from traffic, and the avifauna species observed during the fauna surveys, are present despite this disturbance. While further disturbance to this area, including lighting and marine debris, should be minimised, it is unlikely to present a significant increase to that already created by the Burrup Road (APM, 2019).

Many, but not all of the migratory bird species are expected to utilise Project Ceres area at some time during their periodic visits. However, based on survey work to date Project Ceres area is not likely to be used by large numbers of any of these species. This is primarily to do with the small size of the habitats and the level of local disturbance. Moreover, there are other larger and less disturbed areas of habitat available nearby, such as theMurujuga National Park protected area (APM, 2019).

None of the species present are listed as Threatened species (under federal or state legislation).

4.4 Marine Fauna

4.4.1 EPA Assessment 1705

EPA Assessment 1705 considered the impact of Project Ceres on Marine Fauna, and at the commencement of the assessment, determined Marine Fauna was a Key Environmental Factor.

Project Ceres is located on the Burrup Peninsula in proximity to the Dampier Archipelago which is recognised for its very high marine biodiversity and conservation values (DoE 2006). Mermaid Sound, which is located adjacent to the Dampier Archipelago supports a range of marine-related industry sector uses including shipping and wastewater disposal (Cardno 2020).

Marine Levels of Ecological Protection (LEPs) in the Pilbara region were set out and updated in the Pilbara Coastal Water Quality Consultation Outcomes – Environmental Values and Environmental Quality Objectives Marine Series Report No 1 (DoE 2006). The majority of Mermaid Sound has been assigned with high to maximum LEPs (DoE, 2006). The areas surrounding the various industrial facility jetties and wharves in Mermaid Sound and Dampier Port have moderate LEPs. Brine and process water discharge areas for industrial facilities including the 1 ha area surrounding the ocean outfall of the Water Corporation's Multi-User Brine Return Line (MUBRL) in King Bay have low LEPs.

Given the measures that will be used to manage the risk of urea product spillages during ship loading of urea product at Dampier Port, and the discharge of wastewater into the marine environment, the EPA considers that the potential residual impacts on **marine water quality are unlikely to be significant**.

The EPA noted that light pollution impacts in the Dampier Port area will be managed to avoid impacts 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 nanometers or longer), such as amber, yellow or red in colour
- the use of white lights will be avoided
- lighting will be kept low, shielded and directional, and away from water where possible to minimise horizon glow
- light intensity in nearshore areas will be minimized as far as practicable.

The proposal will result in an increase of 1 or 2 shipping vessel movements per week for the export of urea. This small increase in shipping numbers would be overshadowed by the typical variability in shipping numbers associated with existing and future proposed industries. Therefore, the incremental risk to marine fauna associated with shipping movements is unlikely to be significant.

Having regard to:

- the management measures that will be used to minimise the impact of light spill on marine turtles.
- comments on the proposal from the DAWE relating to this factor.
- Environmental Factor Guideline – Marine Fauna (EPA 2916g).
- the significance of considerations in the Statement of Environmental Principles, Factors and Objectives (EPA 2020e), the EPA considers it is unlikely that the proposal would have a significant impact on Marine Fauna and that the impacts to this factor are manageable.

Accordingly, **the EPA did not consider marine fauna to be a key environmental factor** at the conclusion of its assessment. Full justification for this decision by the EPA is provided in Appendix 4 of the EPA Assessment Report 1705.

While the EPA considers Marine Fauna are not a key environmental factor, mitigation measures to limit impacts on conservation significant marine fauna species have been included in this TSMP.

4.4.2 Desktop Assessment

Listed threatened marine species and listed migratory species are Matters of National Environmental Significance (MNES) and are protected under the EPBC Act.

Pendoley Environmental Pty Ltd (Pendoley) carried out a desktop assessment on marine fauna (Pendoley, 2019). The full report, including discussion on marine birds (seabirds and shorebirds) and marine turtles, is provided in **Attachment B**. The threatened marine fauna species identified through the desktop assessment are provided in Table 4-2.

Marine and Migratory birds were considered in Section 4.3.

Table 4-2 Threatened marine fauna species identified through desktop assessment.

Species	Common Name	EPBC Status	Type of Presence
Species 'known' to occur within area			
Caretta caretta	Loggerhead Turtle	E	Foraging, feeding or related behavior known to occur within area
Megaptera novaeangliae	Humpback Whale	V	Species or species habitat known to occur withinarea
Chelonia mydas	Green Turtle	V	Breeding known to occur within area
Eretmochelys imbricata	Hawksbill Turtle	V	Breeding known to occur within area
Natator depressus	Flatback Turtle	V	Breeding known to occur within area
Pristis clavata	Dwarf Sawfish, Queensland Sawfish	V	Species or species habitat known to occur withinarea
Aipysurus foliosquama	Leaf-scaled Sea snake	CR	Species or species habitat known to occur withinarea
Tursiops aduncus	Spotted Bottlenose Dolphin	M	Migratory
Species 'likely' to occur within area			
Aipysurus apraefrontalis	Short-nosed Sea snake	CR	Species or species habitat likely to occur withinarea
Balaenoptera musculus	Blue Whale	E	Species or species habitat likely to occur withinarea

Dermochelys coriacea	Leatherback Turtle, Leathery Turtle	E	Breeding likely to occur within area
Carcharias Taurus (westcoast population)	Grey Nurse Shark(west coast population)	V	Species or species habitat likely to occur withinarea
Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish	V	Breeding likely to occur within area
Mobula birostris	Giant Manta Ray	M	Migratory
Species that 'may' occur within area			
Dugong dugon	Dugong	M	Migratory

Where E = Endangered, V = Vulnerable, CR = Critically Endangered and M = Migratory

5 Fauna Habitat

As discussed in Section 4.1, APM was engaged to carry out desktop and field surveys of terrestrial flora and fauna. APM (2019) identified Four broad fauna habitats are present within Project Ceres Area: rocky outcrops, hummock grasslands on mid-slopes, drainage lines, and samphire shrublands and supra-tidal flats.

Each fauna habitat type and their importance to conservation significant species is summarised in the following sections (summarising the findings of the *Perdaman Urea Project – Pre and Post-wet season Biological Survey* (APM, 2019), provided in **Attachment B**). Fauna Habitats within Project Ceres clearing boundary are provided in Figure 5-1.

5.1 Rocky Outcrops

Characteristic of the Burrup Peninsula, the formation of Proterozoic igneous rock outcrops (Gidley Granophyre) found within Project Ceres Area, weathered over time and resistant to extensive erosion, produce aggregates of split boulder screens. 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 Project Ceres Area and is likely now locally extinct, as it is currently only patchily distributed in the central and southern Pilbara. The outcrops within Project Ceres Area are small and isolated, and likely to be less important than the larger outcrops to the south, whichprovide greater connectivity and opportunity for secure and productive habitat.

Project Ceres 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 Project Ceres Areain reasonable quantities suggesting a persisting population on the Burrup Peninsula. The Finlayson's Cave Bat (*Vespadelus finlaysoni*) was recorded within this habitat type northwest of Project Ceres Area, close to the boundary. It was also recorded at the south eastern boundary of Project Ceres Area, suggesting it was likely roosting somewhere in the extensive rocky outcrops adjacent the site, that spread east to southeast and using the hummock grasslands for foraging. Similarly, the Little Broad-nosed Bat (*Scotorepens greyii*) was recordedin 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 thegrasslands, instead of the tree-lined and water-filled drainage lines you would expect during the wet.

5.2 Hummock Grasslands on Mid-Slopes

Project Ceres 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 Project Ceres 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 alsopotentially 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 Project Ceres 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.) andferal cat (*Felis catus*) scats. The Northern freetail bat (*Chaerephon jobensis*) was recorded in this habitat typeon only one of the trap nights and on one recorder only.

5.3 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 canopycover of this habitat type in Project Ceres 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 Cove, including those within Project Ceres area, contain mangal systems that could support a diverse range of fauna. This includes birds that may use the rich organicmarine 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 theextensive mangal system. This includes the mouth of King Bay which flows into the tidal flats and smaller mangrove habitat just outside Project Ceres area.

The Northern Coastal Free-tailed Bat (*Ozimops cobourgianus*) is a user of mangroves for roosting, particularlythose 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.

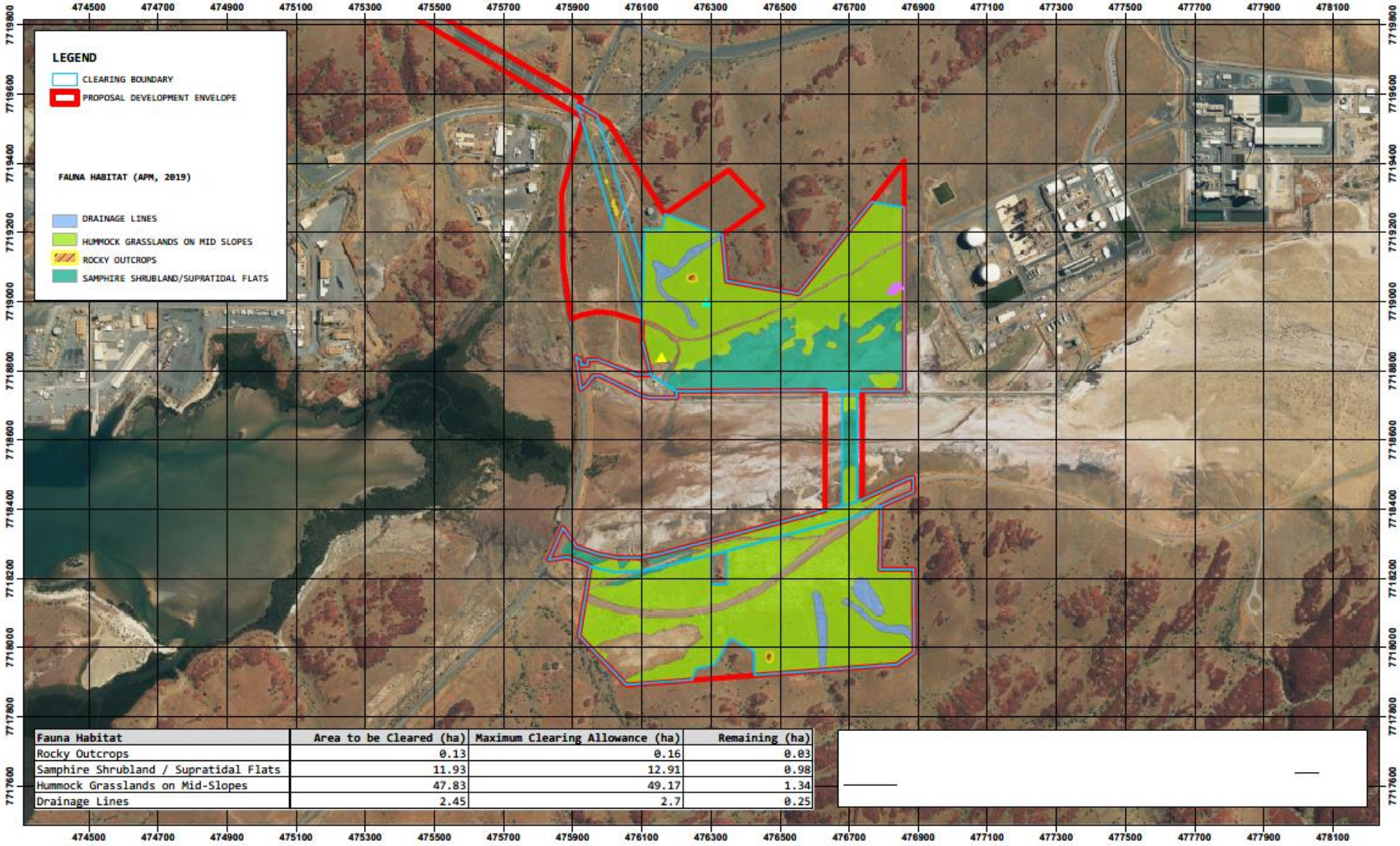
When the area is not inundated, the most common fauna to use the area is the Euro (*O. robustus*). Frequent evidence of this species was found across the flats (tracks and scats).

5.4 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. Thedrainage channel present in the southwest of Project Ceres is quite significant. This area has been excised fromProject Ceres Development Envelope due to its significance.

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 (Figure 4-1).



Fauna Habitat	Area to be Cleared (ha)	Maximum Clearing Allowance (ha)	Remaining (ha)
Rocky Outcrops	0.13	0.16	0.03
Samphire Shrubland / Supratidal Flats	11.93	12.91	0.98
Hummock Grasslands on Mid-Slopes	47.83	49.17	1.34
Drainage Lines	2.45	2.7	0.25

Figure 5-1 Fauna habitats within Project Ceres Clearing Boundary.

33

6 Potentially Impacted Species

The EPA has assessed the residual direct impacts to environmental values from Project Ceres. Concerning threatened species, the EPA notes the following.

6.1 Listed threatened species and communities (sections 18 and 18A) EPBC Act 1999

6.1.1 Ghost Bat (Macroderma gigas)

The Ghost Bat is the largest microchiropteran bat in Australia and the second largest in the world. It is the only carnivorous bat in Australia and the sole residing member of the family Megadermatidae (False Vampires) in Australia and is endemic to the continent. Originally widespread across mainland Australia, the species has experienced a range contraction, and now only persists in in the Pilbara and Kimberley regions and patchily along coastal Queensland and the northern extent of the Northern Territory (APM, 2019).

The suitability of roost sites is the most influential and limiting factor for the distribution of these bats. While ghost bats have exploited abandoned mine shafts and underground pits and found these types of roost sites to be favourable, this species is particularly sensitive to disturbance and is unlikely to return to a site once it has been disturbed in any way (APM, 2019).

While it is daytime, they roost in deep, complex natural cave systems and rock fissures with stable temperatures of 23°–28° and a relative humidity of 50-100%. Approximately 1 hour after sunset the bats will emerge from their roosts and commence hunting for a period of 2 hours. The Ghost Bat uses a surface foraging strategy in which it will perch on vegetation with vantage points to either ambush passing prey on the ground or in the air, or it will glean prey from the ground whilst in flight. Bats change viewpoints frequently during foraging activity and may move up to 360 meters between viewpoints. Ghost Bats have an average foraging area of 61 ha, with individuals typically ranging as far out as 1.9 kilometers from their day roosts. This species is Australia's only truly carnivorous bat, preying on frogs, birds, mice, small lizards, insects and other bats. Ghost Bats typically fly low to the ground, around fence height, and are prone to collisions with wire fences. Due to low fecundity, even infrequent deaths on fences can have a moderate impact on populations (APM, 2019).

Upon the commencement of mating season in July, Ghost Bats will concentrate upon relatively few roost sites. The gestation period takes three months from which the offspring are born during September to November. Juveniles hunt with their mothers until they become completely independent. Colony sizes range from a few individuals to greater than 100, although large colonies are now rare. In the Pilbara, colony sizes in natural roosts are generally much smaller, often consisting of just a few animals. It is during the time of breeding and rearing young that these bats are most sensitive to disturbance.

No suitable roosting caves were located within the Study Area during APM (2019) surveys, although Ghost Bats were detected on two occasions on the south side of the Study Area in close proximity to rocky outcrops. The creek line in the southwest of the Study Area contained large trees and is in close proximity to the rocky outcrops of Murujuga National Park, where roosting habitat may be present. Given the provision of tall trees as vantage points and the proximity to potential roosting habitat, this creek line is considered important Ghost Bat habitat.

Construction of the processing plant should not preclude foraging and may actually increaseforaging opportunities, with nighttime lighting certain to draw a high number of invertebrates to the site. Ghost Bats typically fly low to the ground, around fence height, and are prone to collisions with wire fences. Important drainage line habitat located in the south-west corner of Project Ceres area has been subsequently avoided by excising this area from Project Ceres development envelope. Further avoidance of this habitat has been provided by selecting the northern Hearson Cove Road re-alignment.

The EPA has assessed there to be a significant residual risk to the listed ghost bat. While the direct impact to potential habitat in the proposal is a small percentage of the known extent for this species, the EPA considers that the potential impact of the proposal to the habitat of this conservation significant

species is a significant residual impact. This is consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia, 2014) definition of significant residual impact regarding rare and endangered animals.

GHD (2023) noted that Ghost bats have excellent vision, and it is possible that high dust levels could irritate the eyes or reduce vision and affect their ability to capture prey and for this reason dust is believed to have a moderate level of impact to the species (Biologic, 2019). However, there are a number of persistent ghost bat roosts in close proximity (<500 metres) to mining operations across the Pilbara which suggest they have some tolerance to anthropogenic activities (Bat Call WA 2021). Ghost bats can also fly low to the ground whilst hunting, making them susceptible to inappropriate fencing (Cowan, 2023).

Altered light environments may affect foraging, reproduction, migration, and communication of nocturnal volant species (Longcore & Rich, 2004). The most likely disturbance responses on bats from increases in light spill are the avoidance of illuminated areas previously used for foraging by light-sensitive species, or changes to prey item aggregation for insectivorous species resulting in changes to foraging behaviour.

While ghost bats require darkness in diurnal roosts, there is anecdotal evidence that ghost bats are not light-phobic when foraging (E. Westerhuis pers comms 28th November 2023). Therefore, it is unclear if artificial lighting will directly impact the species. Artificial lighting has been shown to change the established flight routes and delay commuting behaviour in other small bat species, with the potential of forcing bats to use suboptimal flight routes or cause isolation from preferred foraging sites (Cramer et al., 2016; Stone et al., 2009). This suggests that there may be indirect impacts to Ghost Bats through prey species avoiding areas with artificial light. In addition, the strong and persistent lighting used at mine sites creates a 'perpetual full moon' (Longcore & Rich, 2004) that has the potential to affect the timing of activity in crepuscular and nocturnal species and to allow diurnal and crepuscular predators to become facultative nocturnal predators (Gaston et al., 2012). It should be noted that substantial industrial activity currently occurs during night hours on the Burrup peninsula in the form of existing gas and fertiliser plants.

The proposed amendment to allow for night works to proceed on the project site may reduce ghost bat foraging opportunities in the project area. There is also potential for vehicle strikes to occur and impacts from dust generation. For the above reasons, the potential risk to ghost bat through the proposed amendments is considered moderate.

Mitigation measures adopted to reduce the residual risk posed by night works to **low** are provided in section 8.1.

6.1.2 Northern Quoll (Dasyurus hallucatus)

The Northern Quoll is considered Endangered under both Commonwealth and State legislation. In addition to its conservation significance, the species is considered a keystone species in the Pilbara, and one of many 'critical-weight range' mammals under threat across Australia.

Northern Quolls are nocturnal, partially arboreal and omnivorous, primarily feeding on invertebrates, small mammals and reptiles. Once thought to have occupied almost the entire northern third of Australia, the distribution of Northern Quolls is suspected to have declined by over 75%. The Northern Quoll is generally found in rocky and broken country within open Eucalypt Forest, however, can occupy a variety of other habitats, including rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. The Northern Quoll will usually den in hollow tree trunks or in small caves and crevices in rocky outcrops. These areas can be found within deep drainage lines, steep hills and gorges on the island. Management of the Burrup Peninsula population of Northern Quoll is critical to maintain the mainland distribution. Researchers at DBCA have been strongly advising that predator control on the Burrup be increased in order to return the Peninsula to similar densities to that of the neighbouring islands. However, the number of stakeholders involved in such management makes progress slow. Aerial deployment of predator baits has been conducted across the Burrup Peninsula (APM, 2019).

Northern Quoll have been recorded in close proximity to the Study Area. One record in 1990 is less than 1 km from the proposed site, and another at a similar time is approximately 2.2km away. The most recent record is from the northern point of King Bay which is approximately 2.7 km from the

proposed site. Despite a concerted survey effort by APM during the 2018 and 2019 surveys, including cage and Elliot trapping, camera trapping, spotlight searches, and scat searches, Northern Quolls were not recorded. Given the low density of mainland populations of this species, and its cryptic nature, the lack of detections during APM surveys may not indicate the absence of this species from the area. However, the lack of detections does indicate that this species is rare in habitats at the Study Area (APM, 2019).

Northern Quolls on the Burrup Peninsula are likely to inhabit complex landforms of rocky outcrops, which can afford greater cover from predators than more open areas. The current survey area does not include the well-developed and extensive rocky outcrops present immediately north and south of the site (APM, 2019).

Project Ceres layout is forecast to impact 0.16 ha of rocky outcrop habitat which has the potential to be used by the Northern Quoll. The rocky outcrop habitat represents only 0.15% of the totalProject Development area. There are 2811 ha of this same habitat vested for conservation in the Murujuga National Park (57% of the total area of the national park). Therefore, the disturbance to rocky outcrop habitat within Project Ceres area is minimal compared to what is available to fauna in the Conservation Zone.

The EPA has assessed there to be a significant residual risk to the listed northern quoll. While the direct impact to potential habitat in the proposal is a small percentage of the known extent for this species, the EPA considers the potential impact to habitat of the proposal to this conservation significant species is a significant residual impact. This is consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014) definition of significant residual impact regarding rare and endangered animals.

GHD (2023) noted that while no denning habitat is currently available in the Project area, it is assumed the species persists in low numbers on the Burrup Peninsula. The home ranges of individual Northern quoll likely overlap with the Project site and there may be an increased risk that males may be recorded on site in a transitory nature during the breeding season. As Northern quolls are primarily nocturnal, construction activities at night may increase the potential for direct impacts from vehicular strike and indirect impacts through disturbance to individuals' transit and reduced foraging and breeding opportunities. Artificial lighting is known to increase invertebrate activity, and this can attract both Northern quoll and introduced predators such as cats, foxes and wild dogs. It is possible that the presence of human infrastructure, and the availability of resources within these areas, such as rubbish, scraps and insects attracted to the artificial light, attracts Northern quoll to move outside of their normal home range (Henderson, 2015).

With the low abundance of Northern quolls in the Project area and aforementioned potential impacts from proposed amendments to the project, the overall risk to this species is considered moderate.

Mitigation measures adopted to reduce the residual risk posed by night works to **low** are provided in section 8.1.

6.1.3 Pilbara Olive Python (Liasis olivaceus barroni)

The Olive Python is endemic to Australia and only occurs within two distinct regions, giving rise to two distinct subspecies; *Liasis olivaceus olivaceus* which occurs from the Kimberley region to the Great Dividing Range in Queensland, and the Pilbara Olive Python (*Liasis olivaceus barroni*), largely restricted to the Hamersley Range and Dampier Archipelago of the Pilbara region. Other populations of the subspecies have also been recorded in Pannawonica, Tom Price, Millstream and also the Burrup Peninsula (APM, 2019).

The Pilbara Olive Python has been recorded in areas with gorges and escarpments in close proximity to water holes. During the cooler months they will typically hide in caves, crevices and fissures away from water sources. However, in the warmer months they become active and tend to stay near rocky outcrops and water. Their preference for water holes is likely due to resulting abundance of prey, rather than a need for drinking water. This species readily swims in water holes to hunt prey. On the Burrup Peninsula, Olive Pythons have been found to prefer granophyre rock piles and occasionally are found in neighbouring spinifex grasslands (APM, 2019).

The breeding season commences from June through to August. The mating pair will isolate themselves in shelter for up to three weeks. The eggs are deposited around October after a gestation period of 3 months and hatch in January, after which the young disperse (APM, 2019).

Introduced predators represent the main threats to the Pilbara Olive Python. Foxes and cats will prey upon juvenile pythons and compete with adults for prey. Within isolated areas, such as the Burrup Peninsula, development of mining infrastructure may also have adverse impacts on the Pilbara Olive Python. Further, mining development could alter the availability of prey and increase road deaths of this species (APM, 2019).

Rocky outcrop areas inside and immediately adjacent to the Study Area were nocturnally searched during both APM surveys; no Pilbara Olive Pythons, however, were recorded. While the rainfall leading up to the 2019 post-wet season survey was below average, the cyclone event in the preceding week resulted in some fresh water being available. The frequency with which Pygmy Pythons (*Anteresia perthensis*) were detected during the post-wet season survey (5 individuals across 4 nights) suggested that conditions were appropriate for other python species during this survey (APM, 2019).

This species is highly cryptic and occupies complex rocky outcrops and fissures that make detection probability for this species low. As such, it is possible that Pilbara Olive Pythons will use the Study Area. The lack of detections during the APM survey, however, suggests it is infrequent if present. The current survey area does not include the well-developed and extensive rocky outcrops present immediately north and south of the site (APM, 2019).

Project Ceres layout is forecast to impact 0.16 ha of rocky outcrop habitat which has the potential to be used by the Pilbara Olive Python. The rocky outcrop habitat represents only 0.15% of the total Project Development area. There are 2811 ha of this same habitat vested for conservation in the Murujuga National Park (57% of the total area of the national park). Therefore, the disturbance to rocky outcrop habitat within Project Ceres area is minimal compared to what is available to fauna in the Conservation Zone.

The EPA has assessed there to be a significant residual risk to the listed Pilbara olive python. While the direct impact to potential habitat in the proposal is a small percentage of the known extent for this species, the EPA considers the potential impact to habitat of the proposal to this conservation significant species is a significant residual impact. This is consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014) definition of significant residual impact regarding rare and endangered animals.

GHD (2023) noted that Pilbara olive pythons are known to occur within adjacent habitat to the project site with an individual recorded 1.6km to the north of the site in September 2023. Therefore, it is probable that Pilbara olive python has the potential to move through the project area during the construction and commissioning phase of the project.

Night works may increase the risk that Pilbara olive pythons transiting through the site are killed or injured. Due to their slow movement and extensive home ranges, Pilbara olive pythons are susceptible to road strike making impacts from vehicles a key threat (Pearson 2003). Increased night activities on the project site may also adversely affect prey abundance, subsequently restricting potential foraging opportunities for Pilbara olive python.

For the above reasons, the potential risk to Pilbara olive python through the proposed amendments is considered moderate.

By implementing mitigation and management measures outlined in section 8.1, the loss of Pilbara olive python individuals associated with night works can be minimised and is not expected to cause significant impacts to the species resulting in a risk rating of **low**.

6.1.4 Night parrot (Pezoporus occidentalis)

The Night parrot (*Pezoporus occidentalis*) was not identified during previous biological surveys (Worley Astron, 2006 and APM, 2019). While it was identified that the habitat requirements of this species are met, the species is highly unlikely as this species is exceptionally rare and in low numbers.

GHD (2023) noted that the species population is expected to be no more than 250 mature individuals with no more than 50 individuals in each sub-population. Targeted surveys across Australia since 2013

have detected no more than 30 individuals though it should be acknowledged it is difficult to survey the entire suitable habitat range. Birdlife International argues that "the failure to find many additional sites, despite searching, suggests that it is prudent to assume there may be no more" (Birdlife International, 2023).

As most detections or observations of night parrot have occurred in remote areas distant from industry, it is unclear how artificial lighting and anthropogenic sources of light, noise, dust and vibration may impact the species. A confirmed record of the species call detected adjacent to the Fortescue Metals Group Cloudbreak iron ore mine in the central Pilbara region may suggest the species may be tolerant of a certain level of industrial activity (FMG, 2021). It should be noted that substantial industrial activity currently occurs during night hours on the Burrup peninsula in the form of existing gas and fertiliser plants.

Considering the very low likelihood of Night Parrot occurring in the project area, the proposed amendment to approval conditions allowing for night works and the removal of machinery idling component is considered to pose a low risk of adverse impacts.

Mitigation measures adopted to reduce the residual risk posed by night works to **negligible** are provided in section 8.1.

6.1.4 Marine fauna

The EPA notes that the export of urea product for the proposal will result in an additional 1 or 2 shipping movements per week in Dampier Port. However, the EPA is aware that there were 10,521 vessel movements recorded in Dampier Port in 2018-2019. In view of this, the EPA considers that the very small increase in shipping movements within Dampier Port and Mermaid Sound due to the proposal (i.e. up to about 104 per year or 1.0%) is unlikely to have a significant additional impact on listed species such as marine turtles, sharks, whales, and dolphins.

Construction and operation of the proposed urea plant on Sites C and F is not expected to have a significant impact on marine turtle species due to light overspill as the nearest known turtle nesting locations at Holden Beach and No Name Bay are situated about 2.6 km and 3 km away from Site C, respectively, and 3.5 km and 3.9 km from Site F, respectively. Also, light emissions from plant and infrastructure on Sites C and F directed in a north-easterly direction towards Holden Beach and No Name Bay will be largely obscured by the elevated rocky terrain situated to the north of Sites C and F. Although the proposal's product storage shed, product conveyor, and shiploader within the Dampier Port area are located about 1.3 km from Holden Beach and 2 km from No Name Bay, light emissions from these sources are unlikely to result in significant additional cumulative light overspill related impacts over and above those already occurring from the existing industrial light sources at Dampier Port, the north shore of King Bay, the Karratha Gas Plant, and the Pluto LNG facility. The EPA understands that plant lighting will be designed in accordance with *AS 4282-1997: Control of Obtrusive Effects of Outdoor Lighting Guidelines* and that light shields will be placed on large equipment to minimise light overspill. The EPA notes that the lighting that will be installed on proposal related infrastructure in the Dampier Port area will have a wavelength of 580 nanometers or longer and will be yellow, amber, or red in colour which is in the low visual sensitivity range for marine turtles.

6.2 Listed migratory species (sections 20 and 20A) EPBC Act

6.2.1 Migratory Birds

The EPA has assessed there to be a significant residual risk to the listed Migratory/Marine bird species due to the impact on potential Samphire Shrubland/ Supratidal Flats habitat. This is consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014) definition of significant residual impact regarding rare and endangered animals.

GHD (2023) notes that artificial lighting may impact migratory shorebird's ability to forage in particular areas.

A 2010 study on the impacts of impulsive noise (noise often emitted by industrial works) on shorebirds, demonstrated a statistically significant positive relationship between the decibel level experienced by the birds and the behavioural response observed, suggesting the louder the noise the greater the

behavioural response (Wright, et al, 2010). It should be noted that substantial industrial activity currently occurs during night hours on the Burrup peninsula directly adjacent to the salt marsh area, in the form of existing gas and fertiliser plants. Birds that do use the area to forage where possible may be somewhat habituated to the anthropogenic activity nearby.

Given the analysis that the supratidal area adjacent to the site is of relatively low habitat importance to shorebirds and limited occurrences of the species considered in the EPA assessment within the site or habitat adjacent to the site, the risk of the proposed amendments to these species is considered low.

Mitigation measures adopted to reduce the residual risk posed by night works to **negligible** are provided in section 8.1.

6.2.2 Migratory Marine Fauna

Given the relatively small, predicted increase in shipping movements and the measures that will be used to manage wastewater discharge and minimise light overspill and the risk of urea product spillages into the marine environment, the EPA considers that the potential impacts on migratory marine fauna species such as marine turtles, humpback whales, and dugongs are unlikely to be significant.

6.3 Conservation Significant Vertebrate Terrestrial Fauna

The EPA identified the following proposal activities could impact on its environmental objective for terrestrial fauna:

- noise, vibration and light
- removal of breeding, nesting and foraging habitats and the introduction of predators
- habitat disturbance and fragmentation of fauna habitats as a result of construction
- entrapment, injury or death during construction and operations
- inadvertent injury and/or mortality as a result of vehicle strikes from increased traffic during construction and operations
- injury and/or mortality as a result of increased waste material during construction and operations.

The EPA considered the key environmental values likely to be significantly impacted by the proposal are conservation significant vertebrate fauna species. These included the:

- Ghost bat (*Macroderma gigas*) – Vulnerable (BC Act), Vulnerable (EPBC Act)
- Northern Coastal Free-tailed Bat (also known as North-western Free-tailed Bat) (*Mormopterus cobourgianus*) – Priority 1 (BC Act)
- Northern quoll (*Dasyurus hallucatus*) – Vulnerable (EPBC Act and BC Act)
- Pilbara olive python (*Liasis olivaceus barroni*) – Endangered (EPBC Act), Priority 4 (BC Act)
- Curlew sandpiper (*Calidris ferruginea*) – Critically Endangered (EPBC Act and BC Act)
- Red knot (*Calidris canutus*) – Endangered (EPBC Act and BC Act)
- Lesser sand plover (*Charadrius mongolus*) – Endangered (EPBC Act and BC Act)
- Bar-tailed godwit (*Limosa lapponica baueri*) – Vulnerable (EPBC Act and BC Act)
- Australian fairy tern (*Sternula nereis nereis*) – Vulnerable (EPBC Act and BC Act)
- Great Knot (*Calidris tenuirostris*) – Critically Endangered (EPBC Act and BC Act)
- Eastern curlew (*Numenius madagascariensis*) – Critically Endangered (EPBC Act and BC Act).

Listed EPBC Act species are discussed in Section 6.1.

In addition, Species and Communities, Department of Biodiversity, Conservation and Attractions (DBCA) identified the following conservation significant species (under the BC Act) as potentially being taken or disturbed, and requiring specific management controls:

- Night parrot (Pezoporus occidentalis)
- Bilby (Macrotis lagotis)
- Pilbara leaf-nosed bat (Pilbara form), (*Rhinonicteris aurantia*)

Perdaman notes these species were not identified by the EPA as being species that require specific management actions.

6.3.1 Northern Coastal Free-tailed Bat (*Mormopterus cobourgianus*)

The Northern Coastal Free-tailed Bat is listed as Priority 1 under the BC Act as it is a relatively little-known species. There are few published studies on this species, with most relying on general information about the Genus, or field guides. This species occurs in coastal areas of the Pilbara region in WA, and the Top End of the Northern Territory. The Northern Coastal Free-tailed Bat is brown to grey-brown, with a paler belly that is greyish lemon. They roost in the upper dead branches of the Grey Mangrove (*Avicennia marina*), emerging in groups of up to 100 after sunset and dispersing to forage in pairs or alone (APM, 2019).

The Northern Coastal Free-tailed Bat generally forages in mangroves and associated monsoon forests and is known to use openings and linear clearings (such as roads or creeks) to navigate through the canopy. Within the Study Area, this species was recorded throughout all habitats, and on many occasions. It is likely that this species may roost in the mangrove vegetation to the west of the Study Area (APM, 2019).

The Northern Coastal Free-tailed Bat was recorded on 27 nights during the APM (2019) biological surveys. This bat species generally forages in mangroves and associated monsoon forests and is known to use openings and linear clearings (such as roads or creeks) to navigate through the canopy. Within the Study Area, this species was recorded throughout all habitats, and on many occasions. It is likely that this species may roost in the mangrove vegetation to the west of the Study Area (outside the development envelope) (APM, 2019). Proposed mitigation measures mean that there is unlikely to be a material indirect impact to this species. The habitat will not be directly disturbed by construction activities. The EPA considers that the proposal is unlikely to have a material impact on the Northern Coastal Free-tailed Bat.

GHD (2023) notes whilst there is a relative dearth of studies relating to light impacts to the Northern coastal free-tailed bat, as with many nocturnal species, artificial lighting may impact foraging regimes and dispersal of many bat species. Artificial lighting can delay feeding by reducing the ability for bats to determine night fall and create light barriers that bats will not cross restricting foraging and dispersal ranges (DCCEEW, 2023).

Foraging Northern free-tailed bats that utilise the area above the project site and adjacent habitat may be impacted by proposed nightworks in the form of light pollution, dust and noise. The species has been confirmed on site and likely roosts in nearby mangrove communities.

For these reasons, the residual risk to this species is considered moderate.

The risk rating for the species is considered **low** after applying the mitigation measures provided in section 8.1.

6.3.2 Bilby (Macrotis lagotis)

The Bilby (*Macrotis lagotis*) was not identified during previous biological surveys (Worley Astron, 2006 and APM, 2019). While it was identified that the habitat requirements of this species are met, the species is highly unlikely to occur in Project Ceres Area due to the lack of appropriate burrowing substrate, and the presence of foxes.

GHD (2023) notes that due to it being extremely unlikely the species exists on or near the project area, the risk rating allocated to the species is low.

Mitigation measures adopted to reduce the residual risk posed by night works to **negligible** are provided in section 8.1.

6.3.3 Pilbara leaf-nosed bat (Pilbara form) (Rhinonicteris aurantia)

The Pilbara leaf-nosed bat (Pilbara form) (*Rhinonicteris aurantia*) was not identified during previous biological surveys (Worley Astron, 2006 and APM, 2019). While it was identified that the habitat requirements of this species are met and would be more likely to use the area for foraging, and potentially use shallower caves provided by the outcrops as a temporary refuge in the wet-season as they can forage several kilometers from their day-time roost sites. The species is predated quite heavily by Ghost Bats.

GHD (2023) notes that it is considered unlikely the species occurs in significant numbers within the study area. Mitigations to reduce impacts of lighting and dust may lessen the chance of attracting foraging individuals to the site thereby reducing the possible impact of negative vehicular interactions.

The risk rating for the species is considered **low** and may be **negligible** after applying the mitigation measures provided in section 8.1.

7 Risks to Threatened Species

7.1 Reduction and / or Fragmentation of Terrestrial Fauna Habitat

Supra-tidal flats within Project Ceres area and mangrove vegetation surrounding King Bay to the west provide locally important habitat for a range of species, especially waders and shorebirds. Project Ceres, however, will avoid direct disturbance of this habitat type. In addition, the vehicle access that crosses the supra-tidal flats will be designed with culverts to avoid alteration of surface water flows, mitigating potential indirect impacts todownstream habitats.

To enable the construction and operation of Project Ceres's permanent infrastructure, approximately 62.34 ha of vegetation that may provide habitat for threatened terrestrial species within Project Ceres footprint will need to be cleared. Table 7-1 provides the habitat type, potential threatened species and the total area being cleared during the Proposal's construction program.

Table 7-1 Fauna habitat types within Project Ceres Clearing Boundary

Fauna Habitat	Potential Threatened Species	Total (ha)
Rocky Outcrops	Pilbara Olive Python	0.13
	Northern Quolls	
	North-western free-tailed bat	
Hummock Grasslands on Mid Slopes	Pilbara Olive Python	47.83
	Northern Quolls	
Samphire Shrubland/ Supratidal Flats	Curlew Sandpiper	11.93
	Red Knot	
	Lesser Sand Plover	
	Bar-tailed Godwit	
	Australian Fairy Tern	
	Great Knot	
	Eastern Curlew	
	North-western free-tailed bat	
Drainage Lines	Ghost Bat	2.45
Total (ha)		62.34

7.2 Vehicle Strike

Impacts with moving vehicles can cause injury or death of native terrestrial 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 interactionscould be more prevalent.

Marine fauna, especially turtles, could be impacted by increased shipping movements and marine vessel strikes.

7.3 Increase in Introduced Terrestrial Fauna and Weeds

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

Similarly, some feral species such as mice, rats, dogs, cats, pigs 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 (*Vulpesvulpes*) 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 beenrecorded 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 is known to adversely affect many species and ecological communities, it can change the behaviour and/or physiology, reducing survivorship or reproductive output. It can also have the indirect effect of changing the availability of habitat or food resources. It can attract predators and invasive pests, both of which may pose a threat to listed species (DOEE, 2020).

Although they spend most of their lives in the ocean, female turtles nest on sandy tropical and subtropical beaches, predominantly at night. They rely on visual cues to select nesting beaches and orient on land. Artificial night lighting on or near beaches has been shown to disrupt nesting behaviour. Beaches with artificial light have lower densities of nesting turtles than dark beaches. Hatchling sea finding behaviour may be disrupted by artificial lights, which interfere with natural lighting and silhouettes (DOEE, 2020).

All species of seabirds are vulnerable to the effects of lighting. Seabirds active at night while migrating, foraging or returning to colonies are most at risk. Fledglings are more affected by artificial lighting than adults due to the synchronised mass exodus of fledglings from their nesting sites. They can be affected by lights up to 15 km away. Similarly, migratory shorebirds can be impacted by artificial light. Artificial light can disorient flying birds, affect stopover selection, and cause their death through collision with infrastructure. Birds may starve as a result of disruption to foraging, hampering their ability to prepare for breeding or migration (DOEE, 2020).

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. Project Ceres may impact on nesting turtles and turtle hatchlings through disorientation and misorientation. Artificial light from Project Ceres can disorient seabirds causing collision, entrapment, stranding, grounding, and interference with navigation (being drawn off course from usual migration route), and migratory seabirds may also be impacted through disorientation.

Potential sources of light pollution associated with Project Ceres are also associated with night works during construction and commissioning 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

associatedwith earthworks could have a potential impact on fauna. Similarly, during Project Ceres's operational phase, noiseemissions from plant, conveyor and loading facilities could impact terrestrial and marine fauna.

The prevention of, and reduction of impacts from noise and vibration is managed through the implementation of the Construction Environmental Management Plan Noise Management Protocol 0000-ZA-E-09071.

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.

Stormwater and brine storage ponds could attract fauna, particularly birds. The use of chemical larvicides or adulticides to control mosquitoes has the potential to adversely impact these species.

7.7 Marine Environmental Quality

Marine Levels of Ecological Protection (LEPs) in the Pilbara region were set out and updated in the *Pilbara Coastal Water Quality Consultation Outcomes – Environmental Values and Environmental Quality Objectives Marine Series Report No 1* (DoE 2006). The majority of Mermaid Sound has been assigned with high to maximum LEPs (DoE, 2006). The areas surrounding the various industrial facility jetties and wharves in Mermaid Sound and Dampier Port have moderate LEPs. Brine and process water discharge areas for industrial facilities including the 1 ha area surrounding the ocean outfall of the Water Corporation's Multi-User Brine Return Line (MUBRL) in King Bay have low LEPs.

Operation of Project Ceres has the potential to impact on marine environmental quality due to:

- the discharge of saline water (brine) and wastewater into King Bay via the existing Water Corporation MUBRL.
- deposition of air emissions (urea dust from Site C) and spillages of urea product and fugitive urea dust during ship loading and conveying of urea from the storage shed to the ship loader entering the marine environment
- surface water from stormwater run-off from hardstand areas which has the potential to cause erosion and the transport and deposition of sediments into King Bay via the supratidal flats.

7.8 Inland Water Flows and Water Quality

Project Ceres impacts on inland waters may cause indirect impacts to threatened species.

The EPA considered the likely residual impacts of Project Ceres on inland waters were:

- impacts to surface water quality from stormwater run-off and project infrastructure, which is unlikely to be material.
- impacts to groundwater from potential abstraction and saline wastewater discharge to the Water Corporation's Multi-User Brine Return Line (MUBRL), which is likely to be consistent with the EPA objective for inland waters, provided appropriate management measures are implemented.
- potential impacts to surface water and groundwater from the disturbance of acid sulfate soils, which is likely to be consistent with the EPA objective for inland waters, provided appropriate management measures are implemented.

Project Ceres's location within a coastal area supports a distinct correlation between the surface waters and groundwater environment. The main aquifer bodies are overlain with supratidal deposits, and both are considered to be unconfined in nature and in hydraulic connection with groundwater discharge within the intertidal zone. Groundwater levels are particularly shallow within the supratidal areas and are expressed as surface waters during periods of high rainfall.

The following activities may impact on inland waters, causing an indirect impact on threatened fauna:

- Clearing, grubbing, excavations, cut and fill.
- Construction of access tracks, laydown and hardstand areas.
- Infrastructure construction.
- Construction of the causeway.
- Acid sulfate soil management.

Due to this distinct correlation between groundwater and surface water and in consideration of the EPA Environmental Factor for “Inland Waters” groundwater and surface water impacts are considered and addressed through the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.

7.9 Waste Management

Potential direct impacts on threatened species caused by waste generation and management are putrescible waste hygiene and the attraction of vermin or native fauna.

Indirect impacts include controlled waste, liquid waste, hazardous and non-hazardous solid waste management, concrete washout, and stormwater management impacting inland waters and marine environmental quality.

The management of waste at Project Ceres is through the implementation of the Solid and Liquid Waste Management Plan PCF-PD-EN-SLWMP and the Confirmed Fauna Management Plan PCF-PD-EN-FaMP.

7.10 Fire

Fires as a result of construction or operational activities may impact threatened species through the following methods:

- Altered fire regimes negatively impacting vegetation, and associated values, including injury or death of native fauna caused by fire.
- Loss of habitat from fires.
- Fauna displacement and increased competition.

The prevention of, and reduction of impacts from fires is managed through the implementation of the Construction Environmental Management Plan Fire Management Protocol 0000-ZA-E-09071.

7.11 Dust

Dust generated by site activities, particularly clearing, ground disturbing works and transportation of urea during operations causing dust deposition on vegetation may impact the health and overall condition of fauna habitat.

Dust during construction activities is managed through implementation of the Construction Environmental Management Plan Air Quality Management Protocol 0000-ZA-E-09071.

7.12 Risk Assessment of Impacts to Threatened Species

Table 7-2 Threatened and migratory species risk assessment

Species	Identified Risks
Northern Quoll **Pilbara Olive Python**	Reduction and/or fragmentation of fauna habitat: • Habitat disturbance and fragmentation of habitats because of construction of Project Ceres. • Removal of breeding, nesting and foraging habitats. Vehicle strike:

	• Inadvertent injury and/or mortality as a result of vehicle strikes from increased traffic during construction and operations. Introduced terrestrial fauna: • Lethal poisoning as a result of ingestion of Cane Toad toxin (Cane Toads are yet to be recorded in the Burrup Peninsula). • Feral predators through competition for food or direct predation. Introduction of weeds: • Habitat disturbance / fragmentation resulting from the ingress of weeds. Light, noise and vibration: • Construction activities occurring during sensitive periods including during breeding seasons or during the night. • Ecological stress from noise and vibration during construction works. Fauna entrapment • Fauna entrapment causing injury or death during construction and operations. Inland flows and water quality: • Changes to inland surface and groundwater quality and quantity. • Chemical or oil spill resulting in pollution. Waste Management: • Injury and/or mortality as a result of increased waste material during construction and operations. Fire: • Changes in habitat structure and floristics. • Removal of vegetation cover. Dust: • Habitat disturbance resulting from the deposition of dust.
Outcomes	With implementation of the Management Actions provided in Table 8-1 and additional mitigation strategies outlined in Section 8.1, GHD (2023) has assessed that the residual risk of night works to the Northern Quoll and Pilbara Olive Python species from the Project will be low. Perdaman shall contribute to the Pilbara Environmental Offsets Fund for the loss of a maximum of 64 ha of threatened terrestrial and migratory species. The Fund delivers environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes aregreater than the sum of individual offset contributions.
Residual Risk Level	Low Risk
Species	**Identified Risks**
Ghost Bat	Reduction and/or fragmentation of fauna habitat: • Removal of foraging habitat. Introduced terrestrial fauna: • Lethal poisoning as a result of ingestion of Cane Toad toxin (Cane Toads are yet to be recorded in the Burrup Peninsula). • Feral predators through competition for food. Introduction of weeds: • Habitat disturbance / fragmentation resulting from the ingress of weeds. Light, noise and vibration:

	• Lighting may cause avoidance of the area for foraging, and indirectly impacting through prey avoidance of artificial light. • Ecological stress from noise and vibration during construction works. Fauna entrapment • Fauna entrapment causing injury or death during construction and operations. • Collision with fences. Inland flows and water quality: • Changes to inland surface and groundwater quality and quantity. • Chemical or oil spill resulting in pollution. Fire: • Changes in habitat structure and floristics. • Removal of vegetation cover. Dust: • Habitat disturbance resulting from the deposition of dust.
Outcomes	With implementation of the Management Actions provided in Table 8-1 and additional mitigation strategies outlined in Section 8.1, GHD (2023) has assessed that the residual risk of night works to the Ghost Bat from the Project will be low. Perdaman shall contribute to the Pilbara Environmental Offsets Fund for the loss of a maximum of 64 ha of threatened terrestrial and migratory species. The Fund delivers environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes aregreater than the sum of individual offset contributions.
Residual Risk Level	Low Risk
Species	**Identified Risks**
Migratory/Marine Birds	Reduction and/or fragmentation of fauna habitat: • Habitat disturbance and fragmentation of habitats because of construction of Project Ceres. • Removal of breeding, nesting and foraging habitats. Vehicle strike: • Inadvertent injury and/or mortality as a result of vehicle strikes from increased traffic during construction and operations. Introduced terrestrial fauna: • Feral predators through direct predation. Introduction of weeds: • Habitat disturbance / fragmentation resulting from the ingress of weeds. Light, noise and vibration: • Construction activities occurring during sensitive periods including during breeding seasons or during the night. • Ecological stress from noise and vibration during construction works. Fauna entrapment • Fauna entrapment causing injury or death during construction and operations. Inland flows and water quality: • Changes to inland surface and groundwater quality and quantity. • Altered hydrogeological regimes. • Chemical or oil spill resulting in pollution.

	Waste Management: • Injury and/or mortality as a result of increased waste material during construction and operations. Fire: • Changes in habitat structure and floristics. • Removal of vegetation cover. Dust: • Habitat disturbance resulting from the deposition of dust.
EPA Assessment	The EPA has assessed there to be a significant residual risk to the listed Migratory/Marine bird species due to the impact of clearing of potential Samphire Shrubland/ Supratidal Flats habitat.
Outcomes	With implementation of the Management Actions provided in Table 8-1, it is expected that the Proposal will have a low to negligible impact on the abundance, speciesdiversity, geographic distribution and productivity of migratory bird species. Perdaman shall contribute to the Pilbara Environmental Offsets Fund for the loss of a maximum of 64 ha of threatened terrestrial and migratory species. The Fund delivers environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes aregreater than the sum of individual offset contributions.
Residual Risk Level	Low to Negligible Risk
Species	**Identified Risks**
Migratory Marine Fauna	Light, noise and vibration: • Construction activities occurring during sensitive periods including during breeding seasons or during the night. • Ecological stress from noise and vibration during construction works. Inland flows and water quality: • Changes to inland surface and groundwater quality and quantity. • Chemical or oil spill resulting in pollution. Marine environmental quality • Discharge of brine and wastewater into King Bay via the existing Water Corporation MUBRL. • Deposition of air emissions (urea dust from Site C) and spillages of urea product and fugitive urea dust during ship loading and conveying of urea from the storage shed to the ship loader entering the marine environment • Surface water from stormwater run-off from hardstand areas which has the potential to cause erosion and the transport and deposition of sediments into King Bay via the supratidal flats Vessel strike: • Inadvertent injury and/or mortality as a result of vessel strikes from increased shipping during operations.
EPA Assessment	The EPA considered the incremental risk to marine fauna associated with shipping movements is unlikely to be significant. The EPA considers that the potential impacts on migratory marine fauna species such as marine turtles, humpback whales, and dugongs are unlikely to be significant.
Outcomes	The EPA considered the risks to marine fauna are likely to be insignificant where all Confirmed management plans are implemented.
Residual Risk Level	Negligible Risk
Species	**Identified Risks**

Night Parrot	Light, noise and vibration: • Construction activities occurring during sensitive periods including during breeding seasons or during the night. • Ecological stress from noise and vibration during construction works.
Outcomes	With implementation of the Management Actions provided in Table 8-1 and additional mitigation strategies outlined in Section 8.1, GHD (2023) has assessed that the residual risk of night works to the night parrot from the Project will be negligible.
Residual Risk Level	Negligible Risk

8 Mitigation and Management Actions

Mitigation and management actions (Environmental Management Strategy) have been developed to mitigate the risks to:

- EPBC Act and BC Act Listed threatened species and communities, including the Ghost Bat, Northern Quoll, Pilbara Olive Python and Marine Fauna
- EPBC Act Listed migratory species, including migratory birds and migratory marine fauna.

The Environmental Management Strategy includes identification of potential impacts, objectives, targets, and management actions aimed to protect threatened terrestrial fauna species. The Environmental Management Strategy for threatened terrestrial fauna species is provided in Table 8-1.

Perdaman has taken a 'hierarchical approach' to the mitigation of potential impacts associated with Project Ceres, and in the first instance, has sought to avoid areas of conservation significant fauna habitat through design refinement. Where impacts cannot be avoided, Perdaman has designed Project Ceres to reduce the intensity and / or extent of impacts on conservation significant fauna individuals and habitat.

The management actions focus the greatest management effort on reducing habitat loss and impact to individual threatened fauna species. These management actions were specifically developed to ensure that impacts are minimised as far as practicable during the final design, construction and operation of Project Ceres. They have been informed by the results of field studies, best practice and recent experience on similar projects in Western Australia

Mitigation and management actions for the Bilby, Night Parrot and Pilbara Leaf-nosed Bat. These species have been assessed as being highly unlikely to occur within Project Ceres area, and the Northern Coastal Free-tailed Bat habitat will not be directly disturbed by construction activities.

Perdaman applied a standard risk assessment matrix to its operations, whereby the 'likelihood' and 'consequence' of events is considered, with management and mitigation actions identified to control the level of risk. The risk assessment, with the resulting 'risk outcome', has been based upon the residual risk levels after management and mitigation activities are implemented. The assessments have applied the definitions for both likelihood and consequence as prescribed within DOE (2014).

Table 8-1 Environmental Management Strategy for Listed Threatened and Migratory Species

Potential Impacts	• Reduction and/or fragmentation of terrestrial fauna habitat • Vehicle strike • Increase in introduced fauna and weeds • Light, noise and vibration • Entrapment and poisoning • Inland water flows and water quality • Waste management • Fire • Dust
Objective	Minimisation of actual or potential impacts to threatened fauna and listed migratory birds resulting from the construction phase of Project Ceres.
Target	No impacts to threatened fauna and listed migratory birds from the construction phase of Project Ceres.
Species	• Northern Quoll • Pilbara Olive Python • Ghost Bat • Migratory Birds
Management Action 1	
Project Ceres will clear a **maximum** of 73.05 ha of native vegetation, including a **maximum** of 64 ha of listed threatened and migratory habitats (as approved through MS 1180): • 0.16 ha of Rocky Outcrops habitat • 49.17 ha of Hummock Grasslands habitat • 2.7 ha of Drainage Line habitat • 11.97 ha of Samphire Shrubland/Supratidal Flats habitat.	
Monitoring / Reporting Actions	
Monitoring:	

- Ground Disturbance Permits (GDP's) to be issued for all clearing and disturbance activities.
- Actual clearing carried out monitored by relevant personnel.
- Ongoing monitoring of clearing authorised by GDP's but not yet conducted, and clearing carried out.

Reporting:

- Monthly clearing report compiled which compares the progress against the clearing limits both visually (using GIS data) and numerically.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Compliance Assessment Report (CAR) to the EPA in accordance with Condition 15-6 of MS 1180.
- Annual Compliance Report (ACR) submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- One or more Impact Reconciliation Reports (IRR) to document the clearing undertaken. IRRs will be submitted to DWER for contributions payable to be determined.
- Environmental Performance Report (EPR) submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- GDPs issued prior to clearing activities.
- Surveys to be carried out when a GDP is applied for, and when GDP is closed out to ensure compliance with GDP.
- Monthly surveys of cleared areas to determine actual clearing and disturbance footprint.
- Monthly Project Environmental Reporting with clearing reports.
- IRRs will be prepared biennially. The first reporting period will commence on the day clearing commences, ending on the second 30 June following. Each successive reporting period runs from 1 July until the second 30 June following.
- CARs will be submitted annually or at another time agreed in writing by the CEO.
- ACRs will be submitted annually or as agreed by the Minister.

- EPRs will be prepared every 5 years. The first EPR shall be submitted within 3 months of the expiry of the 5-year period commencing from the first date of ground disturbing activities.

Responsibility

Perdaman Environment and Heritage Manager

Supporting Documents

- Ground Disturbance Permits
- Impacts Reconciliation Procedure (PCF-PD-EN-IRP)
- Clough GIS System and Plans
- Ministerial Statement Number 1180
- Flora Management Plan (PCF-PD-EN-FMP)

Trigger and Threshold Criterion

Trigger Criterion:

- Actual and planned clearing within the development envelope exceeds 90% (65.75 ha) of the approved clearing limit.

Threshold Criterion:

- Actual clearing within the development envelope exceeds the approved clearing limit (73.05ha)
- The extent of clearing exceeds 0.16 ha of Rocky Outcrops habitat
- The extent of clearing exceeds 49.17 ha of Hummock Grasslands habitat
- The extent of clearing exceeds 2.7 ha of Drainage Line habitat
- The extent of clearing exceeds 11.97 ha of Samphire Shrubland/Supratidal Flats habitat.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Check flagging, boundary fencing and signage of areas to be cleared/ not cleared has been undertaken and is obvious to those on the ground.

Threshold Contingency Actions:

- Cease all clearing activities.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.

- Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
- Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
- Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency actions Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 2

Avoid construction activities during Pilbara Olive Python inactive and breeding periods to limit impacts on this species (inactive period from early November to late April, and breeding season May to July).

Monitoring / Reporting Actions

Monitoring:

- Clearing schedule to align with Pilbara Olive Python protection measures.
- Visual Inspection of Pilbara Olive Python habitat (Rocky outcrops).

Reporting:

- Any Pilbara Olive Python fauna deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of Pilbara Olive Python reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.

- Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
- Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

Pilbara Olive Python inactive period from early November to late April, and breeding season May to July.

- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- Fauna interactions to be reported to DBCA annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

Supporting Documents

- BC Act Section 40 Authorisation TFA 2223-0317.
- Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Threatened Species Management Plan (PCF-PD-EN-TSMP)
- Fauna Management Plan (PCF-PD-EN-FaMP)

Trigger and Threshold Criterion

Trigger Criterion:

- Clearing activities occurring close to or during breeding season or inactive period resulting in sightings.

- Increase in sightings of Pilbara Olive Python during pre-clearance surveys or sightings by fauna spotters during clearing activities.

Threshold Criterion:

- Injury or death of Pilbara Olive Python.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Fauna spotters to maintain awareness of species location after sighting until relocation can occur.
- Notify the Environment and Heritage Manager immediately upon identification.
- Undertake further education and awareness training to personnel.
- Engage a qualified fauna handler to remove and safely relocate the species to a suitable area.

Threshold Contingency Actions:

- Cease all clearing activities.
- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Any Pilbara Olive Python fauna deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of Pilbara Olive Python reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.

- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DCCEEW and DBCA.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 3

Prior to clearing, engage a qualified fauna specialist to conduct a trapping and relocation program in accordance with DBCA's Standard Operating Procedures (SOPs) and permit/licence conditions as required under the BC Act.

Authorisation under Section 40 of the BC Act, TFA 2223-0317, requires 2 weeks prior to clearing, a trapping and relocation program will be undertaken (in accordance with the Trace Ecology Fauna Relocation Justification and Methodology, 2023).

Monitoring / Reporting Actions

Monitoring:

- Confirm trapping and relocation program is to be implemented 2 weeks prior to clearing.
- Confirm trapping and relocation program is to be implemented in accordance with the Trace Ecology Fauna Relocation Justification and Methodology, 2023.
- Confirm fauna spotting and relocation activities shall be conducted by suitably qualified and experienced personnel.

Reporting:

- Final report to be provided to Perdaman by qualified ecologist to identify fauna species detected in the work area using the specified trapping methods.
- All fauna interactions to be recorded in the Fauna Interaction Register.
- Any threatened fauna or migratory bird species deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths threatened fauna or migratory bird species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

• Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required. • Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded. • Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180. • CAR to the EPA in accordance with Condition 15-6 of MS 1180. • ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval. • EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.
Timing
• Trapping and relocation program to occur 2 weeks prior to clearing. • Monthly Project Environmental Reporting. • CAR and ACR submitted annually. • Fauna interactions to be reported to DBCA annually. • EPR submitted every 5 years.
Responsibility
Perdaman Environment and Heritage Manager
Supporting Documents
• Authorisation under Section 40 of the BC Act, TFA 2223-0317. • Regulation 28 Fauna Taking (Relocation) Licence FR28000358 • Trace Ecology Fauna Relocation Justification and Methodology, 2023 • Threatened Species Management Plan (PCF-PD-EN-TSMP) • Fauna Management Plan (PCF-PD-EN-FaMP)
Trigger and Threshold Criterion
Trigger Criterion: • Procedures for clearing trapping and relocation programs are not in alignment with DBCA SOP's. • DBCA SOP's not reviewed prior to program implementation.

- Pre-clearance report not complete or missing information.

Threshold Criterion:

- Trapping and relocation program not carried out prior to clearing activities in accordance with Authorisation under Section 40 of the BC Act, TFA 2223-0317.
- Clearance surveys, trapping and relocation program procedures not implemented in accordance with DBCA SOP's.
- Fauna spotting and relocation activities conducted by inexperienced personnel.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Do not commence clearing until such time as the pre-clearance survey and report are in accordance with the DBCA SOP.

Threshold Contingency Actions:

- Do not commence clearing.
- Cease implementation of trapping and relocation program.
- Review DBCA SOP's and revise and amend trapping and relocation program accordingly.
- Seek to employ suitably qualified fauna personnel.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel
- Consult with MAC.

Management Action 4

All fauna spotting during clearing activities will be conducted by suitably qualified and experienced personnel

Monitoring / Reporting Actions

Monitoring:

- Confirm fauna spotting during clearing activities shall be conducted by suitably qualified and experienced personnel.

Reporting:

- All fauna interactions to be recorded in the Fauna Interaction Register, including the name of the spotter.
- Any threatened fauna or migratory bird species deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened fauna or migratory bird species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Spotting to occur during clearing activities.
- Monthly Project Environmental Reporting.

- CAR and ACR submitted annually.
- Fauna interactions to be reported to DBCA annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

Supporting Documents

- Authorisation under Section 40 of the BC Act, TFA 2223-0317.
- Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Threatened Species Management Plan (PCF-PD-EN-TSMP)
- Fauna Management Plan (PCF-PD-EN-FaMP)

Trigger and Threshold Criterion

Trigger Criterion:

- No suitably qualified and experienced personnel available to act as spotter during clearing activities.

Threshold Criterion:

- Fauna spotting activities conducted by inexperienced personnel.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Do not commence clearing until such time as there is a suitably qualified and experienced person available to act as spotter.

Threshold Contingency Actions:

- Do not continue clearing.
- Seek to employ suitably qualified fauna personnel.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel
- Consult with MAC.

Management Action 5

Vegetation clearing to be undertaken progressively and incrementally during construction to allow fauna within the development envelope to leave the area and to minimise the pressure on the carrying capacity of native vegetation surrounding the site.

Monitoring / Reporting Actions

Monitoring:

- Pre-clearing meeting carried out for relevant personnel to review the GDP including clearing extents, clearing timing and any additional requirements prior to the commencement of clearing activities.
- Visual observation of clearing activities by suitably qualified fauna spotters of fauna during clearing activities.

Reporting:

- All fauna interactions to be recorded in the Fauna Interaction Register.
- Any threatened fauna or migratory bird species deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened fauna or migratory bird species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.

- Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- During clearing activities.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- Fauna interactions to be reported to DBCA annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

Supporting Documents

- Ground Disturbance Permit.
- Authorisation under Section 40 of the BC Act, TFA 2223-0317.
- Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Threatened Species Management Plan (PCF-PD-EN-TSMP)
- Fauna Management Plan (PCF-PD-EN-FaMP)

Trigger and Threshold Criterion

Trigger Criterion:

- Clearing progress nearing incremental limits authorised by the GDP.

- Pre-clearing meeting not carried out with GDP requirements not reviewed prior to clearing activities.
- No suitably qualified and experienced personnel available to act as spotter during clearing activities.

Threshold Criterion:

- Clearing progress exceeds incremental limits authorised by the GDP.
- GDP requirements not addressed.
- Fauna handled by inexperienced personnel.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Review GDP to ensure incremental clearing is maintained.
- Do not commence clearing until such time as the pre-clearing meeting is carried out.
- Do not commence clearing until such time as there is a suitably qualified and experienced person available to act as spotter.

Threshold Contingency Actions:

- Do not continue clearing.
- Seek to employ suitably qualified fauna personnel.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel
- Consult with MAC.

Management Action 6

Vegetation clearing will be undertaken using GPS location devices that will be clearly flagged with areas beyond the authorised limit as 'No-Go Zones'.

Monitoring / Reporting Actions

Monitoring:

- No-Go Zone demarcations are installed and maintained to ensure that no clearing outside of the **maximum** 73.05 ha of listed threatened and migratory habitats is cleared.
- The extent of clearing in PEC P1 communities where unavoidable will be recorded and maintained to ensure cumulative clearing extents of this community does not exceed the **maximum** 0.16 ha
- Review GPS Mapping against clearing progress daily to ensure adherence with authorised clearing extents.
- Relevant traditional owners are to be invited or appropriately facilitated to observe any ground disturbing activities during construction.
- Survey markers and temporary fencing to be inspected daily by site supervisors and weekly by PER.
- All fencing, including temporary fencing, will exclude the use of barbed wire to minimise risks to the Ghost bat.
- Ensure vehicles associated with all ground disturbance activities are to be equipped with live GPS systems that will notify the driver of the clearing boundary (virtual geofencing) where disturbance is not to exceed.
- Assessment of survey and geospatial data against GDP's comprising the clearing footprint.
- Review of reports from on-ground inspections.
- Survey data converted to Geospatial files will be made available to the PER for desktop review and progress of clearing activities.

Reporting:

- Monthly clearing report compiled which compares the progress against the clearing limits both visually (using GIS data) and numerically.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing
• During clearing activities. • GDP issued as required. • Surveys to be carried out when a GDP is applied for, and when GDP is closed out to ensure compliance with GDP. • Daily inspection of GPS equipment. • Weekly assessment of geospatial data. • Monthly surveys of cleared areas to determine actual clearing and disturbance footprint. • Clearing reports prepared monthly. • Monthly Project Environmental Reporting. • CAR and ACR submitted annually. • EPR submitted every 5 years.
Responsibility
Perdaman Environment and Heritage Manager Perdaman Environmental Representative Equipment operators
Supporting Documents
• Ground Disturbance Permit. • Threatened Species Management Plan (PCF-PD-EN-TSMP) • Flora Management Plan (PCF-PD-EN-FMP)
Trigger and Threshold Criterion
Trigger Criterion: • Early works encroaching the approved extent of authorised clearing. • Surveying and pegging of P1 PEC not conducted or missing. • No-Go Zone around PEC P1 and heritage areas missing 5m buffer and 3m warning zone. • GPS alarm tripped on virtual geofencing device.

- Operator reports to supervisor any alarm events and is to reassess the location of the clearing boundary and ensure that direction is taken from a suitably qualified environmental representative before resuming GDA.

Threshold Criterion:

- Actual clearing within the development envelope exceeds the approved clearing limit (73.05 ha).
- Actual clearing within PEC P1 communities exceeds 0.16 ha.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Check flagging, boundary fencing and signage of areas to be cleared/ not cleared has been undertaken and is obvious to those on the ground.
- Survey team to investigate area and re-establish survey markers to peg out and indicate authorised extent of clearing.

Threshold Contingency Actions:

- Do not continue clearing.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel
- Consult with MAC.

Management Action 7

Vegetation clearing conducted in accordance with an internal permitting procedure to facilitate progressive development.

Monitoring / Reporting Actions

Monitoring:

- GDP process is implemented.
- All clearing or ground disturbing activities are conducted with a GDP in place.
- Clearing carried out in accordance with the conditions specified in the GDP.
- Operators, PER and Supervisors review clearing requirements in GDP prior to commencement of clearing or ground disturbance activities.
- Audit issued GDPs against clearing and disturbance carried out.
- Ongoing monitoring of GDPs in place and those pending.
- Periodical review of GDP procedure and training around GDP process.

Reporting:

- Monthly clearing report compiled which compares the progress against the clearing limits both visually (using GIS data) and numerically.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- During clearing activities.
- GDP issued as required.
- Monthly surveys of cleared areas to determine actual clearing and disturbance footprint.
- Clearing reports prepared monthly.
- Monthly Project Environmental Reporting.

- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

Perdaman Environmental Representative

Equipment operators

Supporting Documents

- Ground Disturbance Permit.
- Threatened Species Management Plan (PCF-PD-EN-TSMP)
- Flora Management Plan (PCF-PD-EN-FMP)

Trigger and Threshold Criterion

Trigger Criterion:

- GDP not in place prior to clearing or ground disturbance occurring.
- Actual and planned clearing within the development envelope exceeds 90% (65.75 ha) of the approved clearing limit.
- Pre-clearing meeting not carried out with GDP requirements not reviewed prior to clearing activities.
- GDP procedures not reviewed prior to clearing activities.
- Clearing progress exceeds incremental limits authorised by the GDP.
- GDP procedures implemented incorrectly.

Threshold Criterion:

- Actual clearing within the development envelope exceeds the approved clearing limit (73.05 ha).

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Do not commence clearing until the GDP has been prepared.
- Do not commence clearing until the pre-clearing meeting is carried out.
- Check flagging, boundary fencing and signage of areas to be cleared/ not cleared has been undertaken and is obvious to those on the ground.

- Ensure all personnel have reviewed the requirements of the GDP.
- Review GDP to ensure incremental clearing is maintained.

Threshold Contingency Actions:

- Do not continue clearing.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel
- Consult with MAC.

Management Action 8

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.

Monitoring / Reporting Actions

Monitoring:

- Where structures are used to stabilise rock batters, implement design features where possible to provide roosting sites potentially used by avifauna around Project Ceres site.

Reporting:

- Recording avifauna sightings using the artificial roosts in the Fauna Interaction Register.
- Threatened fauna or migratory bird species interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.

- Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
- Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
- Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Roosts established during construction phase
- Monthly Project Environmental Reporting.
- Threatened species fauna interactions to be reported to DBCA annually.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

SCJV Construction team

Supporting Documents

- Project design specifications
- BC Act Section 40 Authorisation TFA 2223-0317
- Threatened Species Management Plan (PCF-PD-EN-TSMP)
- Fauna Management Plan (PCF-PD-EN-FaMP)

Trigger and Threshold Criterion

Trigger Criterion:

- Roosts within rock batters not included in the design phase of Project Ceres.

Threshold Criterion:

- Roosts within rock batters not installed during construction phase of Project Ceres.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Review design of rock batters to include the installation of sufficient roosting habitat.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel
- Consult with MAC.

Management Action 9

Clearing within the development envelope will only occur in daylight hours to minimise noise, vibration and artificial lighting impacts on threatened terrestrial fauna.

Monitoring / Reporting Actions

Monitoring:

- PER to confirm construction and clearing is to be carried out during daylight hours.
- Ensure the GDP procedures include the details of authorised times to commence clearing.
- Review GDP procedures during clearing activities.
- Construction team to be inducted with the relevant details of allowable operation times.

Reporting:

- Clearing occurring after sundown reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- During clearing.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

SCJV Construction team

Supporting Documents

- BC Act Section 40 Authorisation TFA 2223-0317
- Ground Disturbing Permits.
- Construction Environmental Management Plan 0000-ZA-E-09071
- Confirmed Light Management Plan (PCF-PD-EN-LMP)

- Threatened Species Management Plan (PCF-PD-EN-TSMP)
- Fauna Management Plan (PCF-PD-EN-FaMP)

Trigger and Threshold Criterion

Trigger Criterion:

- Clearing works conducted 1 hour prior to dusk (sundown).

Threshold Criterion:

- Clearing works conducted after sundown.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- All personnel are to be advised that clearing work is to cease prior to sundown.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 10

A fauna spotter will check all open trenches less than two hours after sunrise and before commencing any construction to detect and safely remove any trapped terrestrial fauna.

Monitoring / Reporting Actions

Monitoring:

- Fauna egress infrastructure to be installed within water holding points, trenches and excavations to ensure fauna can escape.
- Visual inspections of water holding ponds, trenches, fauna egress, and excavations.
- Visual inspections for Pilbara Olive Python and Northern Quoll within plant, equipment and machinery prior to activities being carried out onsite each morning, following rain events and during hot weather.
- Visual inspections are to be included in pre-starts.
- Fauna identified as trapped within Project Ceres area, will be relocated in accordance with the BC Act Section 40 Authorisation TFA 2223-0317 and the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.

Reporting:

- Any threatened fauna or migratory bird species deaths and injuries will be reported to DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened fauna or migratory bird species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened fauna or migratory bird species interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Daily checks less than 2 hours after sunrise and before commencing construction.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

SCJV Construction team

Supporting Documents

- BC Act Section 40 Authorisation TFA 2223-0317
- Regulation 28 Fauna Taking (Relocation) Licence FR28000358
- Threatened Species Management Plan (PCF-PD-EN-TSMP)
- Fauna Management Plan (PCF-PD-EN-FaMP)

Trigger and Threshold Criterion

Trigger Criterion:

- Threatened fauna or migratory bird species found in water holding ponds, trenches and excavations.

Threshold Criterion:

- Injury or death of threatened fauna or migratory bird species associated with entrapment.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Ensure fauna egress infrastructure is in place within water holding points, trenches and excavations to ensure fauna can escape.

Threshold Contingency Actions:

- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Any threatened fauna or migratory bird species deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths to threatened fauna or migratory bird species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 11

Topsoil will be stockpiled for later use during the rehabilitation of Project Ceres Area. Vegetation that will be cleared will be stockpiled for later use during rehabilitation of Project Ceres area.

Monitoring / Reporting Actions

Monitoring:

- The first 50mm of topsoil from cleared areas will be retained in permanent or temporary stockpiles for later use during rehabilitation of Project Ceres area.
- Topsoil will not be stockpiled in excess of 2m in height.
- Topsoil will be adequately signed to ensure ease of identification.
- Topsoil will be located a sufficient buffer distance from drainage lines and future works to prevent erosion and unnecessary handling.
- Cleared vegetation will be stockpiled for later use during rehabilitation of Project Ceres area.
- Appropriate topsoil and vegetation stockpile locations will be identified prior to commencement of construction and clearly identified on GDPs (in map form).
- Stockpiled vegetation will be stored downslope of the topsoil to increase the erosion protection and sediment control of the topsoil.
- Stockpiled vegetation will not impede drainage or present a fire hazard.
- All topsoil and vegetation stockpiles will be surveyed to ensure accurate records of locations and volumes are retained.
- PER to approve commencement of construction confirming adequate topsoil and vegetation management.

Reporting:

- Monthly clearing report will include topsoil and vegetation stockpile locations and volumes (using survey data).
- Failure to stockpile topsoil or vegetation recorded as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Identification of locations for stockpiles of topsoil and vegetation to occur prior to commencement of ground disturbing activities.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Perdaman Environment and Heritage Manager

SCJV Construction team

Supporting Documents

- Ground Disturbance Permits

- Material Tracking Register

Trigger and Threshold Criterion

Trigger Criterion:

- Vegetation and topsoil stockpiles are not located in areas identified in the GDP.
- Vegetation and topsoil require double handling to relocate to approved area.
- Adequate topsoil is not removed (less than 50mm depth).
- Vegetation and micro-habitat elements are poorly salvaged.
- Construction activities are commenced prior to PER approval.

Threshold Criterion:

- No vegetation is retained from clearing activities.
- No topsoil is recovered during clearing activities.
- Topsoil stockpiles are located within drainage lines.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Do not commence construction until such time as the PER confirms appropriate topsoil and vegetation management.
- Undertake further education and awareness training to personnel.

Threshold Contingency Actions:

- Cease all clearing and ground disturbing works.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.

- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 12

Site personnel will be inducted to ensure environmental obligations are communicated. Environmental-specific posters displayed in crib rooms and notice boards. Pre-starts to include an environmental focus.

Monitoring / Reporting Actions

Monitoring:

- Monitoring of induction records and training materials to ensure obligations are correctly communicated.
- Inspections to ensure environmental-specific posters are on display.
- Review of pre-start meeting criteria to include a relevant environmental focus.
- Inspections of induction and competency registers to monitor for personnel at risk of non-competency of their obligations.
- Environmental Induction includes:
- Conservation significant species that may occur in Project Ceres area.
- Key risk times for fauna strikes to occur during dawn and dusk.
- Speed limit of 20k/h within disturbance footprint.
- Native fauna has right-of-way.
- Conservation Significant Fauna identification, habitat, management and reporting requirements for fauna sightings. In particular, the differences between identifying the Pilbara Olive Python and other potentially dangerous snake species.
- All snake species to be avoided and sightings notified to the environmental representative and recorded on the fauna interaction register.
- Consequences and penalties that will apply for non-compliance with legislative provisions.
- Posters to be posted in crib rooms and notice boards to raise awareness of environmental obligations.
- Pre-starts to include an environmental focus including the risk of vehicle strike and the restrictions on personnel to prevent incidents with native fauna.

Reporting:

- Inductions to be recorded in the Environmental Induction Register.
- PER to cross reference new starters with attendance at Environmental Induction.
- Records of pre-start meetings with an environmental focus to be retained.

- Lack of competency resulting in fauna impacts will be reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Inductions to be carried out for all new employees prior to commencement on site.
- Environmental focus presented at pre-start at the beginning of every shift.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

All project personnel

Perdaman Environmental Representative

Supporting Documents

- Environmental Induction Register

- Toolbox talks
- Competency register

Trigger and Threshold Criterion

Trigger Criterion:

- Inductions are missing information pertaining to conservation significant species of Project Ceres area or other relevant information that could reduce the risk of vehicle strike.
- Personnel fail competency assessment.
- Personnel non-attendance at inductions.

Threshold Criterion:

- 10% of relevant project personnel missing induction training.
- Personnel show non-competency in the field, resulting in an incident.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Environment and Heritage Manager and PER to review the Environmental Induction content to ensure all information regarding conservation significant species management is provided.
- Reattendance of personnel at induction to ensure competency is attained.
- Report non-attendance to Supervisor.

Threshold Contingency Actions:

- Liaise with Supervisors to ensure all new starters complete induction training upon commencement.
- Implement follow up training to personnel who fail to demonstrate competency of fauna conservation requirements and responsibilities.
- Undertake an assessment of further reducing speed limits in areas that are repeatedly affected by vehicle incidents or other speed attenuation measures (e.g. speed humps)
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.

- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 13

Enforced speed limit for construction and operational vehicles travelling within the development envelope

Monitoring / Reporting Actions

Monitoring:

- During construction, random speed observations and checks will be carried out to ensure all vehicles do not exceed the 20 km/h speed limit.
- During operations, Site C and Site F speed limits will be set at 10 km/h and 30 km/h respectively.
- Speed observations will be carried out using hand-held speed detectors and solar powered radar speed signs will be used across the site to enforce speed limits and provide awareness to personnel on current speeds.
- All personnel operating vehicles are to have a current valid driver's licence prior to deployment to site.
- Inductions to be carried out for all new employees prior to commencement on site.

Reporting:

- Exceedance of speed limits must be reported as an incident
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.

- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Ongoing monitoring throughout construction and operational phases of Project Ceres.
- Inductions to be carried out for all new employees prior to commencement on site.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Traffic Management Plan

Trigger and Threshold Criterion

Trigger Criterion:

- Close calls / near misses with fauna on road networks.

Threshold Criterion:

- Construction vehicles exceeding speed limits.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Undertake further education and awareness training to personnel.

Threshold Contingency Actions:

- Temporary ban of offending personnel from operation of vehicles.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.

- Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
- Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 14

Machinery will idle for at least 30 mins, prior to the commencement of vegetation clearing activities.

For clarity the removal of the 30-minute requirement should be permitted once clearing and activities are completed as the clearing and fencing works would mitigate fauna from entering the construction area and accessing plant and equipment.

Monitoring / Reporting Actions

Monitoring:

- Implement machinery checks and idling of machinery at pre-start meeting.
- Fauna spotters to monitor for fauna during machinery start up and idle times, recording any species identified.
- Operations manager to ensure machinery are idling for no less than 30 mins prior to mobilization of plant.
- Operations manager to supervise pre-starts.

Reporting:

- Vehicles mobilized prior to completing 30-minute idle times reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Prior to disturbance activities taking place.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Operations Manager

Supporting Documents

- Traffic Management Plan

Trigger and Threshold Criterion

Trigger Criterion:

- Machinery not inspected or started during pre-start.

Threshold Criterion:

- Machinery not left in idle for 30 minutes before mobilization.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Undertake further education and awareness training to personnel.

- Start machinery immediately upon realisation of the trigger criterion and allow to idle for 30 minutes.

Threshold Contingency Actions:

- Cease clearing activities immediately upon realization of non-compliance with required idle times.
- De-mobilize plant and keep in idle for the remainder of the required idle period.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 15

Roads and tracks to be speed limited. Information signage to be installed.

Monitoring / Reporting Actions

Monitoring:

- All Project roads and tracks to be speed limited using signposts during construction and operations.
- During construction, random speed observations and checks will be carried out to ensure all vehicles do not exceed the 20 km/h speed limit.
- During operations, Site C and Site F speed limits will be set at 10 km/h and 30 km/h respectively.
- Additional signposts containing information relating to the risk of fauna interactions (vehicle strike) in areas where conservation significant fauna may be present. Locations for additional signposts will be identified during construction and where applicable included in the final road marking design.
- Signposts to be regularly checked to ensure they are upright and remain visible.
- Personnel inducted to correctly interpret fauna signage.

Reporting:

- Exceedance of speed limits reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Ongoing monitoring.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Traffic Management Plan

Trigger and Threshold Criterion

Trigger Criterion:

- Signage damaged, missing, incorrectly installed or difficult to interpret.

Threshold Criterion:

- Construction vehicles exceeding speed limits.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Review signage requirements and ensure signage is installed correctly in accordance with requirements of the Traffic Management Plan.

Threshold Contingency Actions:

- Temporary ban of offending personnel from operation of vehicles.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 16

All non-essential vehicle movements will be scheduled to take place during the day to reduce likelihood of vehicle strikes.

Monitoring / Reporting Actions

Monitoring:

- Vehicle movements to be limited to daylight hours unless considered essential to reduce the likelihood of a fauna interaction.

- Environmental Induction will include definition of “essential vehicle movements”.
- Environmental focus presented at pre-start at the beginning of every shift.

Reporting:

- Non-essential vehicle movements will be recorded as incidents.
- Incidents reported through Monthly Project Environmental Reporting.
- Any Pilbara Olive Python fauna deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of Pilbara Olive Python reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister’s approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Ongoing monitoring.
- Inductions to be carried out for all new employees prior to commencement on site.

- Environmental focus presented at pre-start at the beginning of every shift.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Traffic Management Plan

Trigger and Threshold Criterion

Trigger Criterion:

- Non-essential vehicle movement taking place after sundown resulting in interaction with native fauna (vehicle strike).

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Review procedures in place for non-essential vehicle movements in relation to the likely cause of incident.
- Undertake further education and awareness training to personnel.
- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Any threatened fauna or migratory bird species deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths to threatened fauna or migratory bird species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.

Management Action 17

All vehicles must remain on designated roads and tracks within Project Ceres area.

Monitoring / Reporting Actions

Monitoring:

- All habitat exclusion zones, including the Samphire Shrubland, Supratidal Flats and Drainage habitats to be demarcated using fencing and signage to ensure protection of the exclusion zone.
- Only vehicles approved through the GDP process are to venture off designated roads and tracks within Project Ceres area.

- Environmental Induction to include information on exclusion zones and access limitations to personnel.
- Environmental focus presented at pre-start at the beginning of every shift.

Reporting:

- Driving off designated roads and tracks without prior approval recorded as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Ongoing monitoring.
- Inductions to be carried out for all new employees prior to commencement on site.
- Environmental focus presented at pre-start at the beginning of every shift.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents
• Traffic Management Plan • Construction Environmental Management Plan 0000-ZA-E-09071 • Ground Disturbance Permit
Trigger and Threshold Criterion
Trigger Criterion: • Fencing and signage of exclusion zones damaged, missing or incorrectly installed. Threshold Criterion: • Unauthorised access to exclusion zones and access tracks.
Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:
• Review fencing and signage requirements and ensure fencing and signage is installed correctly in accordance with requirements.
Threshold Contingency Actions:
• Temporary ban of offending personnel from operation of vehicles.
• Where threshold criteria are exceeded:
  ◦ Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  ◦ Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  ◦ Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  ◦ Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
• Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
• Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
• Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
• Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
• Undertake further education and awareness training to personnel.
• Consult with MAC.

Management Action 18
All fauna injuries or death attributed to vehicle strike will be managed humanely.
Monitoring / Reporting Actions

Monitoring:

- Injured animal shall be taken to an authorised veterinarian or trained wildlife carer, or if not possible, humanely euthanized in accordance with DBCA SOPs.
- Roadkill will be moved at least 10 m into surrounding vegetation, when safe to do so to avoid further strikes of fauna feeding on carcass.
- Photographic records of roadkill will be retained in the Fauna Interaction Register.
- Pre-starts to include an environmental focus including the appropriate management of injured or killed fauna caused by vehicle strike.
- Inductions to be carried out for all new employees prior to commencement on site.

Reporting:

- Recording of all interactions with fauna in the Fauna Interaction Register (for fauna killed or injured by vehicle strike).
- Fauna injured or killed by vehicle strike will be reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Any threatened fauna deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened fauna reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.

• ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval. • EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.
Timing
• Inductions to be carried out for all new employees prior to commencement on site. • Environmental focus presented at pre-start at the beginning of every shift. • Monthly Project Environmental Reporting. • CAR and ACR submitted annually. • EPR submitted every 5 years.
Responsibility
Environment and Heritage Manager Perdaman Environmental Representative
Supporting Documents

• Confirmed Fauna Management Plan (PCF-PD-EN-FaMP)
• DBCA SOPs:
  • Humane Killing of Animals under Field Conditions
  • Transport and Temporary Holding of Wildlife
  • Hand Capture of Wildlife
  • Hand Restraint of Wildlife
  • Care of Evicted Pouch Young
• Fauna Interaction Register

Trigger and Threshold Criterion
Threshold Criterion: • Injury or death of conservation significant fauna.
Trigger and Threshold and Contingency Actions
Threshold Contingency Actions:

- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Review procedures and DBCA SOP's in place for management of injured or deceased fauna caused by vehicle strike.
- Any threatened fauna deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 19

Domestic animals and/or pets will not be permitted within Project Ceres area.

Monitoring / Reporting Actions

Monitoring:

- Personnel will not be permitted to allow domestic animals within Project Ceres area.
- Feral cats and dogs observed in Project Ceres area are not to be fed by personnel.

- Inductions to be carried out for all new employees prior to commencement on site to advise on the requirement.

Reporting:

- Recording of domestic animals present in Project Ceres area in the Fauna Interaction Register.
- Presence of domestic animals in Project Ceres area will be reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Inductions to be carried out for all new employees prior to commencement on site.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

All personnel

Environment and Heritage Manager

Supporting Documents

- Confirmed Fauna Management Plan (PCF-PD-EN-FaMP)

Trigger and Threshold Criterion

Trigger Criterion:

- Domestic animal present outside Project Ceres area or at nearby personnel camps / living compounds.

Threshold Criterion:

- Domestic animal present on site.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Notify Environment and Heritage Manager of domestic animal presence and whereabouts.
- Identify owner.
- Do not allow personnel to approach animal unless the owner is present.
- If owner is not identified, relocate animal to an offsite licensed facility.
- Undertake further education and awareness training to personnel.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 20
Introduce and implement hygiene procedures which result in the reduction of food waste around Project Ceres area to reduce the likelihood of introduced/pest species attracted to the facility. All wastes (putrescible, recyclable, non-reusable) will be sent offsite for recycling or disposal.
Monitoring / Reporting Actions

Monitoring:
• Implementation of the Solid & Liquid Waste Management Sub-Plan 0000-ZA-E-09738 and Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP to reduce the likelihood of attraction of introduced/pest species to Project Ceres area.
• Monitoring and management of introduced/pest species will be in accordance with the Pest Management Plan PCF-PD-EN-PMP.
• Weekly environmental inspections to be carried out to ensure compliance with the requirements.
• Pre-starts to include an environmental focus including the appropriate management of waste.
• Inductions to be carried out for all new employees prior to commencement on site.
Reporting:
• Where threshold criteria are exceeded:
  • Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  • Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  • Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  • Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
• Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
• Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
• Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
• CAR to the EPA in accordance with Condition 15-6 of MS 1180.
• ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
• EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing
• Environmental focus presented at pre-start at the beginning of every shift. • Ongoing management of waste.

- Weekly environmental inspections.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

All personnel

Environment and Heritage Manager

Perdaman Environmental Representative

Supporting Documents

- Solid & Liquid Waste Management Sub-Plan 0000-ZA-E-09738
- Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP
- Pest Management Plan PCF-PD-EN-PMP

Trigger and Threshold Criterion

Trigger Criterion:

- Increase in introduced/pest species on site attracted by solid and liquid wastes.
- Solid and liquid wastes not managed in accordance with requirements.

Threshold Criterion:

- Increase in introduced/pest species at Project Ceres area compared with baseline survey recordings.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Notify Environment and Heritage Manager of introduced/pest species presence and whereabouts.
- Notify personnel of introduced/pest species presence in Project Ceres area through pre-start and notice boards.
- Undertake further education and awareness training to personnel.

Threshold Contingency Actions:

- Review controls pertaining to solid and liquid waste management and resubmit plan / protocol with amendments to the EPA and the MAC for approval.

- Review controls pertaining to pest management and resubmit plan with amendments (if made) to the EPA and the MAC for approval.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 21

All general-purpose bins will be lidded and emptied regularly to ensure the lids remain completely shut.

Monitoring / Reporting Actions

Monitoring:

- Implementation of the Solid & Liquid Waste Management Sub-Plan 0000-ZA-E-09738 and Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP to reduce the likelihood of attraction of introduced/pest species to Project Ceres area.
- All waste containers are to have lids which are to always remain closed. No overfilling of bins will be permitted.
- Monitoring for fauna (i.e. mice, birds, cockroaches etc.) feeding from the waste receptacles.
- Inductions to be carried out for all new employees prior to commencement on site to advise on the requirement.

Reporting:

- Bins not emptied or overfilled (not able to be shut) will be reported as incidents.
- Fauna interactions will be recorded in the Fauna Interaction Register.

Timing

- Ongoing management of waste.
- Weekly environmental inspections.
- Monthly Project Environmental Reporting.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Licensed Waste Handler

All personnel

Perdaman Environmental Representative

Supporting Documents

- Solid & Liquid Waste Management Sub-Plan 0000-ZA-E-09738
- Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP
- Pest Management Plan PCF-PD-EN-PMP

Trigger and Threshold Criterion

Trigger Criterion:

- Waste receptacles nearing or breaching capacity weekly.
- Spills from bins due to improper concealment.
- Fauna opportunistically feeding from waste receptables.
- Waste receptacles attracting nuisance species.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Listed Waste Handler to attend site to remove wastes.
- Provide further waste concealment measures appropriate to the exceeded waste location and waste type.
- Review controls pertaining to solid and liquid waste management and resubmit plan / protocol with amendments to the EPA and the MAC for approval.

Management Action 22

Develop a Cane Toad Monitoring and Management Plan, including controls for potential future implementation.
Monitoring / Reporting Actions

Monitoring:

- Monitoring and management of cane toads will be in accordance with the Pest Management Plan.
- If required, Cane Toad Monitoring and Management Plan to include:
  - Monitoring of cane toad front.
  - Changes in populations of threatened species (listed at the start of this table) at risk will be monitored before and after the arrival of cane toads.
- Undertake mitigation activities to protect identified species.
- Work collaboratively to eradicate any individual or small groups of cane toads discovered more than 50km ahead of the main cane toad front, where feasible.
- Develop and implement quarantine procedures for vehicles and equipment to detect hitchhiker cane toads.
- Regularly review public information aimed at minimising the accidental movement of cane toads.
- Facilitate toad musters when feasible and/or promote community cane toad collection to contribute to conditioned taste aversion projects.
- Partner with Aboriginal Ranger groups to manage cane toads.
- Investigate the application of new control methods for cane toads in the field.
- Evaluate methods to protect biodiversity assets from cane toads through exclusion.
- Promote humane methods of cane toad euthanasia and disposal.
- Deliver education and information on cane toads and their management.

Reporting:

- Recording of all interactions with fauna in the Fauna Interaction Register (for cane toad sightings/capture).
- Presence of cane toads in Project Ceres area will be reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Management plan to be developed within 12 months of Project construction commencement, if required.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Pest Management Plan PCF-PD-EN-PMP
- DBCA Cane Toad Strategy for Western Australia 2021-2026

Trigger and Threshold Criterion

Trigger Criterion:

- Cane toad front is likely to advance to Project Ceres area within 12 months.

Threshold Criterion:

- Cane toad occurrence on site.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Prepare management plan and commence implementation.

Threshold Contingency Actions:

- Notify Environment and Heritage manager of cane toad presence and whereabouts.
- Capture and euthanize can toad.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 23

Conduct baseline and annual feral fauna surveys and implement control measures for feral dogs, cats, foxes, pigs and cane toads within Project Ceres area.

Monitoring / Reporting Actions

Monitoring:

- During operations, site perimeter fencing to limit/hinder feral fauna from accessing Project Ceres site and will need to be inspected for integrity.
- During construction, good housekeeping, site hygiene and reporting will be required to manage and control feral fauna.
- Feral fauna surveys will be carried out in accordance with the Pest Management Plan PCF-PD-EN-PMP.
- Baseline pest animal surveys will be undertaken for two years to understand the extent and nature of pest animals inhabiting or utilising Project Ceres site by a suitably experienced ecologist.
- Surveys will occur annually until the desired level of control is reached.
- Ongoing monitoring will be carried out by all personnel through records of sightings in the fauna register.

Reporting:

- Any threatened species fauna deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.

- Injuries and deaths threatened species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Pest Management Plan reviewed annually.
- Surveys carried out annually.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Pest Management Plan PCF-PD-EN-PMP

Trigger and Threshold Criterion

Trigger Criterion:

- Feral animals observed within Project Ceres area.

Threshold Criterion:

- Threatened species are injured or killed as a direct result of feral animals within Project Ceres area.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Feral cats:
  - A trapping program is implemented.
  - Avoid trapping in September to March.
  - A minimum of 25 large cage traps would be set for several nights.
  - Baits may be used by a Licensed Pest Management Technician if trapping ineffective
- Wild dogs:
  - A trapping or baiting program is implemented using a Strychnine Alkaloid bait or trapped using soft jawed traps.
- European Red Fox:
  - A trapping or baiting program is implemented using an ACTA 1080 Concentrate or FOXOFF® Fox baits or trapped using soft- jawed traps.
- Feral rabbits:
  - A baiting program is implemented using ACTA 1080 concentrate.
- House mice and black rat:
  - Ensure all available food sources are eliminated.
  - Trapping can be carried out.
- Feral pigs:
  - A trapping or baiting program is implemented using PIGOUT®.
- Feral horses:
  - Contact local pastoralist for removal.
  - Horses can be shot if not removed.

- Cane toads:
  - Capture and place in a vented container.
  - Cool to 4C to render unconscious prior to placing in freezer for 2 days to be euthanized.
- The Pest Management Plan PCF-PD-EN-PMP will be reviewed periodically throughout the life of Project Ceres (at least every 12 months) to assess effectiveness of its measures and maintain relevance to current works or operations.
- Should performance of controls be inadequate then the measures will be updated to achieve performance objectives. Additional review will be required in the event of an environmental incident or change in activities.
- Additional monitoring will be undertaken and will occur in conjunction with appropriate management measures until pest animal presence reduces to baseline levels or below.

Threshold Contingency Actions:

- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Any threatened fauna deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DCCEEW and DBCA.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 24
Conduct baseline and annual weed surveys and implement control measures comprising manual removal, herbicide treatment and stockpile containment for weeds within Project Ceres area.
Monitoring / Reporting Actions

Monitoring:
• Weed monitoring and management will be carried out in accordance with the Weed Management Plan PCF-PD-EN-WMP and Weed Management Sub-Plan 0000-ZA-E-09739.
• A baseline weed mapping survey within Project Ceres footprint and adjacent areas will be undertaken before civil works to establish a baseline of the habitat condition, type of weeds found and the extent of their population.
• Biennial weed survey and mapping will be undertaken within Project Ceres footprint to record the type and distribution of the weed species.
• Surveys to be carried out biennially.
Reporting:
• A weed register will include the following records:
  • All records of weeds observed within Project Ceres boundary.
  • Records of weeds disposed offsite and at licensed disposal facilities.
  • Monitoring of material used for onsite mulching for weed and/or weed propagules.
  • Records of herbicide applications and other weed control measures applied within Project Ceres boundary.
• CAR to the EPA in accordance with Condition 15-6 of MS 1180.
• ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
• EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing
• Surveys carried out biennially. • Weed Management Plan PCF-PD-EN-WMP reviewed annually • CAR and ACR submitted annually. • EPR submitted every 5 years.
Responsibility
Environment and Heritage Manager
Supporting Documents

- Weed Management Plan PCF-PD-EN-WMP
- Weed Management Sub-Plan 0000-ZA-E-09739
- Material Tracking System.
- Weed register.

Trigger and Threshold Criterion

Trigger Criterion:

- Introduction and/ or increase in abundance of significant weed species in Project area.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Identify the weed species present within Project Ceres area.
- Map the distribution of the newly introduced significant weed species.
- Plan and implement a significant weed control program (may involve seeking advice from relevant authorities).
- Identify activities that may have potentially introduced significant weed species.
- Apply hygiene control and staff training (e.g. inductions, toolbox/site meetings and communications).
- Review and update Weed Management Plan as required to include further hygiene controls.

Management Action 22

Prevent weeds on topsoil and vegetation stockpiles.

Monitoring / Reporting Actions

Monitoring:

- Weed monitoring and management will be carried out in accordance with the Weed Management Plan PCF-PD-EN-WMP and Weed Management Sub-Plan 0000-ZA-E-09739.
- Monitoring of contaminated topsoil via the Material Tracking Register.
- Inspections to ensure stockpiles are correctly signed, bunded and stored.
- Inductions will train personnel to identify weed species who will have responsibility of notifying the Environment and Heritage Manager of sighted weeds.

Reporting:

- Maintenance of the Weed Register.

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Weekly inspections of stockpiles.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Weed Management Plan PCF-PD-EN-WMP
- Weed Management Sub-Plan 0000-ZA-E-09739
- Material Tracking System.
- Weed register.

Trigger and Threshold Criterion

Trigger Criterion:

- Weeds occurring in stockpiles and disturbed areas.

Threshold Criterion:

- Weeds in proliferation and impacting success of native vegetation

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Identify the weed species present within Project Ceres area.
- Map the distribution of the newly introduced significant weed species.
- Plan and implement a significant weed control program (may involve seeking advice from relevant authorities).
- Identify activities that may have potentially introduced significant weed species.
- Apply hygiene control and staff training (e.g. inductions, toolbox/site meetings and communications).
- Review and update Weed Management Plan as required to include further hygiene controls.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 26

Prevent introduction of weeds into Project Ceres area through implementation of weed hygiene measures.

Monitoring / Reporting Actions

Monitoring:

- Weed monitoring and management will be carried out in accordance with the Weed Management Plan PCF-PD-EN-WMP and Weed Management Sub-Plan 0000-ZA-E-09739.
- Good weed hygiene practices will be followed throughout Project Ceres, including:
  - vehicle/plant inspection
  - wash down procedures for all construction plant,
  - light vehicles, scraper bowls and truck trays carrying soil, which are entering and leaving Project Ceres areas
  - dedicated vehicle inspection and wash down areas are to be positioned at site entry / exit points
- All heavy vehicles and plant involved in earthworks and civil works will be washed down, inspected and accompanied by an independent certificate of verification of weed hygiene prior to site entry. Upon arrival on site, they will be inspected at the site gate by the PER, or delegate, and documented using the Contractor's Vehicle and Mobile Equipment Weed Inspection Form.
- Prior to the movement or reuse of any soil, borrow, fill or other weed risk material within Project Ceres site, the material is to be certified as free from weeds by conducting and documenting a weed inspection prior to the first movement of material from the source location. The Weed Risk Materials Hygiene Form will be used for this purpose.

Reporting:

- Failure to implement required hygiene practices reported as an incident.
- Incidents reported through Monthly Project Environmental Reporting.

Timing

- Vehicle and equipment inspections to be carried out at the time of vehicle entry to site.
- Vehicle and equipment wash down at the time of demobilization from site.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Equipment Operators

Supervisors

Supporting Documents

- Weed Management Plan PCF-PD-EN-WMP

- Weed Management Sub-Plan 0000-ZA-E-09739
- Material Tracking System.
- Weed register.

Trigger and Threshold Criterion

Trigger Criterion:

- Weed hygiene measures are not followed for all vehicles and equipment.
- Introduction and/ or increase in abundance of significant weed species in Project area.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Identify the weed species present within Project Ceres area.
- Map the distribution of the newly introduced significant weed species.
- Plan and implement a significant weed control program (may involve seeking advice from relevant authorities and Murujuga Aboriginal Corporation).
- Identify activities that may have potentially introduced significant weed species.
- Apply hygiene control and staff training (e.g. inductions, toolbox/site meetings and communications).
- Review and update Weed Management Plan as required to include further hygiene controls.

Management Action 27

Weed Risk Areas/Zones are established.

Monitoring / Reporting Actions

Monitoring:

- Weed Risk Areas/Zones will be managed in accordance with the Weed Management Plan to ensure there is no spread of weeds from these areas into Project Ceres area.
- Weed Risk Areas/Zones will be demarcated by survey markers and temporary fencing, to be inspected daily by site supervisors and weekly by PER.
- Weed Risk Areas/Zones will be identified on weed maps and through the Ground Disturbance Permit (GDP) process and shall be treated as avoidance sites wherever possible.
- Weed risk areas will inform weed control and weed hygiene requirements.

Reporting:

- Unauthorised entry into weed risk areas will be reported as incidents.
- All Vehicle Weed Inspection Forms to be completed and maintained.

• Incidents reported through Monthly Project Environmental Reporting.
Timing
• Ongoing monitoring • Monthly Project Environmental Reporting • CAR and ACR submitted annually. • EPR submitted every 5 years.
Responsibility
Environment and Heritage Manager Perdaman Environmental Representative
Supporting Documents
• Ground Disturbance Permit • Weed Management Plan PCF-PD-EN-WMP • Weed Management Sub-Plan 0000-ZA-E-09739 • Vehicle Weed Inspection Forms
Trigger and Threshold Criterion
Trigger Criterion: • Unauthorised access into Weed Risk Areas/Zones. • Surveying and pegging of Weed Risk Areas/Zones are missing.
Trigger and Threshold and Contingency Actions
Trigger Contingency Actions: • Investigate cause with Project Ceres team and update procedures to ensure the breach does not reoccur. • Redefine boundaries/ signs if due to inadequate boundary marking or unclear signs. • Communicate incident investigation outcomes to Project personnel. • Apply hygiene control and staff training (e.g. inductions, toolbox/site meetings and communications).

- Review and update Weed Management Plan as required to include further hygiene controls.

Management Action 28

Project Ceres will avoid, where possible, and otherwise use best practice technology and risk-based management actions to minimise nightglow and light overspill from Project Ceres so that biological diversity and ecological integrity are maintained.

Monitoring / Reporting Actions

Monitoring:

- To minimise impacts on marine turtles, seabirds and migratory shorebirds, lighting will be monitored and managed in accordance with the Confirmed Light Management Plan PCF-PD-EN-LMP.
- A benchmark Artificial Light at Night (ALAN) survey will be carried out at selected locations including (but not limited to):
  - Project Ceres area
  - Hearson's Cove
  - Deep Gorge, and
  - Locations selected after consultation with MAC.
- Monitoring will capture benchmark regional artificial light data during new moon conditions.
- An impact assessment will be carried out using the information from the proposed lighting design, benchmark light monitoring program and the modelling.
- The impact assessment will review Project Ceres against the Commonwealth guideline best practice light principles, qualitative assessment of the horizon visibility of sky glow/ direct light sources and the Bortle Class sky quality guide.
- Details regarding the minimum suitable mitigation measures and best practice lighting design will be included in the impact assessment and will apply to both construction and operational lighting.
- An ongoing ALAN monitoring program to inform an adaptive management framework to support continuous improvement in light management will be developed and will include one round of post construction monitoring and reporting.
- Implementation of Construction Environmental Management Plan Light Management Protocol 0000-ZA-E-09071.
- All Project Personnel working on Project Ceres site will be made aware of the Confirmed Light Management Plan PCF-PD-EN-LMP and the Construction Environmental Management Plan Light Management Protocol 0000-ZA-E-09071 through the site induction. All Contractors undertaking construction works will be provided with a copy of the Confirmed Light Management Plan PCF-PD-EN-LMP and the Construction Environmental Management Plan Light Management Protocol 0000-ZA-E-09071.
- Pre-starts to include an environmental focus including the key elements of the Confirmed Light Management Plan PCF-PD-EN-LMP and the Construction Environmental Management Plan Light Management Protocol 0000-ZA-E-09071 to reinforce its requirements and maintain compliance throughout Project Ceres.
- Environmental inspections to assess:
  - Attraction of feral species
  - Incidents and interactions with Threatened and / or native species
- MAC consultation or concerns in relation to heritage places
- Environmental incidents and corrective action close out.

Reporting:

- Reporting lighting requirements to Project Ceres Director in design reports.
- Results of benchmark light monitoring to be reported in Confirmed Light Management Plan PCF-PD-EN-LMP.
- Records of pre-start meetings with an environmental focus to be retained.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Lighting Design to be prepared prior to Construction and Confirmed Light Management Plan PCF-PD-EN-LMP and the Construction Environmental Management Plan Light Management Protocol 0000-ZA-E-09071 implemented throughout construction and operations (as it applies to each phase).
- Commissioning light monitoring carried out post construction, during plant commissioning.
- Environmental focus presented at pre-start at the beginning of every shift.
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Design Manager

Construction Manager

Project Director

Environment and Heritage Manager
Supporting Documents
• Confirmed Light Management Plan PCF-PD-EN-LMP • Construction Environmental Management Plan Light Management Protocol 0000-ZA-E-09071
Trigger and Threshold Criterion
Threshold Criterion: • Failure to implement best practice technology or management actions specified in the Confirmed Light Management Plan PCF-PD-EN-LMP. • Non-compliance with the requirements of the Confirmed Light Management Plan PCF-PD-EN-LMP or Construction Environmental Management Plan Light Management Protocol 0000-ZA-E-09071 • Marine turtle hatchlings orientation is affected by increased lighting from Project Ceres.
Trigger and Threshold and Contingency Actions

Threshold Contingency Actions:
• In the event a management action for lighting aspects is not implemented or met, the Environment and Heritage Manager will be notified immediately with all relevant information.
• All reasonable actions to implement the management action will be undertaken to rectify the non-compliance.
• If a management action requires adjustment following evaluation of monitoring data, review of assumptions and uncertainties, re-evaluation of risk assessment, increased understanding of the environmental setting, or changes to the proposal scope or technology, Perdaman will seek formal approval from the Office of the EPA and may require consultation with MAC if the plan is reviewed and updated on account of these changes.
• Where threshold criteria are exceeded:
  • Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  • Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  • Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  • Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
• Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
• Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
• Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
• Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.

- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 29

Development and implementation of monitoring program for the cumulative lighting impacts on marine turtle hatchlings, migratory seabirds and shorebirds.

Monitoring / Reporting Actions

Monitoring:

- A benchmark ALAN survey will be carried out over 5 nights during new moon conditions between the 28 Feb 2022 and 4 March 2022 using Sky42 light monitoring equipment that will be deployed at selected locations including (but not limited to):
  - Project Ceres site.
  - Hearson's Cove.
  - Deep Gorge; and
  - Locations selected after consultation with MAC.
- An ongoing ALAN monitoring program to inform an adaptive management framework to support continuous improvement in light management will be developed and shall include one round of post construction monitoring and reporting
- A final survey shall be conducted upon commissioning of the plant to compare the baseline to the operational facility.

Reporting:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing
• Within 1 year of the commencement of operations of Project Ceres.
Responsibility
Environment and Heritage Manager
Supporting Documents
• Confirmed Light Management Plan PCF-PD-EN-LMP
Trigger and Threshold Criterion
Threshold Criterion: • Failure to implement monitoring program. • Light Management Plan PCF-PD-EN-LMP requires review and amendment as a result of the findings of the monitoring program.
Trigger and Threshold and Contingency Actions

Threshold Contingency Actions:
• If a management action requires adjustment following evaluation of monitoring data, review of assumptions and uncertainties, re-evaluation of risk assessment, increased understanding of the environmental setting, or changes to the proposal scope or technology, Perdaman will seek formal approval from relevant authorities and consult with MAC if the plan is reviewed and updated on account of these changes.
• Provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the lighting impacts from Project Ceres.
• Where threshold criteria are exceeded:
  • Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  • Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  • Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  • Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
• Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
• Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
• Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
• Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.

- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 30

Project Ceres will avoid, where possible, and otherwise use best practice technology and risk-based management actions to minimise the impact of noise and vibration from Project Ceres so that biological diversity and ecological integrity are maintained.

Monitoring / Reporting Actions

Monitoring:

- Noise complaints will be monitored to ensure compliance with the noise regulations and investigated to determine any adverse impacts, including towards fauna occurring near or adjacent the complaint source location.
- Monitoring of the fauna interactions register to determine avoidance patterns in species.
- Fauna monitoring in the Environmental Performance Report will determine the location of sightings from baseline surveys and compare in each report to determine any site avoidance behaviours potentially arising from noise and vibration.
- Monitor reports or incident of noise and/or vibration emissions and orientation from Project Ceres.
- Reports or incident of noise and/or vibration emissions and the noise orientation.
- Intrusive noise (including vibration) issues associated with Project Ceres will be managed in compliance with relevant statutory standards and to ensure they do not negatively impact noise sensitive receptors, including native bats, turtles and other threatened fauna species.
- The Construction Environmental Management Plan Noise Management Protocol 0000-ZA-E-09071 provides guidance on how noise emissions from a range of sources including construction equipment, drilling, blasting, piling and commissioning of plant, the conveyor and ship loader, will be minimised.

Reporting:

- Reporting noise and vibration mitigation requirements to Project Ceres Director in design reports.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.

- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Daily monitoring of noise.
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Design Manager

Construction Manager

Project Director

Environment and Heritage Manager

Supporting Documents

- Construction Environmental Management Plan Noise Management Protocol 0000-ZA-E-09071
- Confirmed Fauna Management Plan PCF-PD-EN-FaMP

Trigger and Threshold Criterion

Trigger Criterion:

- Noise or vibration complaints received.
- Identification of site avoidance behaviours.
- Noise exceeds a value which is 5 dB below the assigned level for the area impacted by noise.

Threshold Criterion:

- Noise exceeds the assigned level allowable in an area.
- Noise and/or vibration emissions and orientation identified to negatively or adversely impact conservation significant fauna roosting or nesting.
- Noise and/or vibration emissions and orientation identified as a cause of disorientation or displacement of native fauna in the area.

Trigger and Threshold and Contingency Actions

Threshold Contingency Actions:

- In the event a management action for noise and vibration aspects are not implemented and or met, the Environment and Heritage Manager will be notified immediately with all relevant information.
- All reasonable actions to implement the management action will be undertaken to rectify the non-compliance.
- If a management action requires adjustment following evaluation of monitoring data, review of assumptions and uncertainties, re-evaluation of risk assessment, increased understanding of the environmental setting, or changes to the proposal scope or technology, Perdaman will seek formal approval from relevant authorities and consult with MAC if the plan is reviewed and updated on account of these changes.
- Provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the lighting impacts from Project Ceres.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 31

Maintain equipment such that all noise emitting equipment is fully serviceable and working to the correct specifications. High noise and vibratory works will be scheduled for hours least likely to affect conservation significant fauna species

Monitoring / Reporting Actions

Monitoring:

- Mobile plant and equipment will be routinely inspected to ensure noise does not exceed the assigned levels.
- Equipment to be inspected by a suitable qualified trade (e.g., mechanic) prior to operating on Site.
- Reporting:

- Plant failure / shutdowns will be reported as incidents.
- Report inspection details and vehicle reference in the Mechanical Inspection Form and Mechanical Inspection Register.
- Monitored through weekly environmental inspections and incident records.
- Daily pre-starts of equipment.

Reporting:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Weekly environmental site inspections
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Equipment Operators

Supervisors

Supporting Documents

- Construction Environmental Management Plan Noise Management Protocol 0000-ZA-E-09071
- Mechanical Inspection Form
- Mechanical Inspection Register

Trigger and Threshold Criterion

Trigger Criterion:

- Engine / mechanical issues lead to increased noise during operations.
- Inspections identifying mechanical issues. Engine / mechanical failure of plant.
- Mechanical issues lead to exceedance of noise and vibration regulations.

Threshold Criterion:

- > 65 dB(A) at plant boundary (Operations only)

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Inform the Site Supervisor of any potential mechanical issues during works.
- Report exceedance to the Environment and Heritage Manager.
- Safely transport mobile plant (if applicable) to laydown area.
- If in operation during mechanical issues, shutdown plant upon identification.
- Mechanical works and inspections to take place on hardstand areas in case of leaks or spills of oils, fuels or lubricants.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.

- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 32

A review of noise impacts from Project Ceres on terrestrial and marine fauna species will be carried out.

Monitoring / Reporting Actions

Monitoring:

- Noise monitoring at sensitive receptors.
- Monitoring of fauna noise avoidance behaviours.
- Monitoring of fauna occurrences and proximity to site during operations at varied noise levels.

Reporting:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Initial monitoring to occur within 1 year of the commencement of operations of Project Ceres.

- Additional noise monitoring will be addressed in the Part V Works Approval and Licence.
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Noise monitoring reports and modelling
- Environmental Noise Assessment (Lloyd George Acoustics, 29 May 2019).
- Construction Environmental Management Plan Noise Management Protocol 0000-ZA-E-09071

Trigger and Threshold Criterion

Trigger Criterion:

- Noise exceeds a value which is 5 dB below the assigned level for the area impacted by noise.

Threshold Criterion:

- > 65 dB(A) at plant boundary (Operations only)
- Identification of site avoidance behaviour from terrestrial fauna and/or marine fauna due to project related noise, including reduced turtle and bird nesting and reduction of roosting migratory bird species.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Excessive noise is reported to the Environment and Heritage Manager.
- Investigate to determine the cause of the trigger criteria being exceeded and potential environmental impact that may occur due to the trigger criteria being exceeded.
- Undertake corrective actions to reduce noise emissions as identified through the investigation.
- Undertake further education and awareness training to personnel.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.

- Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
- Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 33

Project Ceres will avoid, where possible, and otherwise use best practice technology and risk-based management actions to minimise the impact of dust from Project Ceres so that biological diversity and ecological integrity are maintained.

Monitoring / Reporting Actions

Monitoring:

- Management of dust at Project Ceres area will be in accordance with the Air Quality Management Plan, Construction Environmental Management Plan Air Quality Management Protocol 0000-ZA-E-09071, Traffic Management Plan and relevant Australian Standards to ensure dust emissions do not negatively impact sensitive receptors.
- The Air Quality Management Plan will be reviewed and revised to include any specific requirements of the Part V approvals in relation to dust emissions. The plan will also consider the requirements to protect heritage values and fauna during construction activities.
- Air emissions during operation of Project Ceres and equipment will be within Project Ceres's approved thresholds.
- Where monitoring results indicate higher emissions than those stated in Project Ceres's approval conditions, corrective actions must be implemented as soon as practicable to reduce emissions below the permitted level.

Reporting:

- Reporting dust mitigation requirements to Project Ceres Director.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Daily inspections during clearing and construction activities.
- Inspections following rain events
- Weekly environmental inspections of native flora health.
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Air Quality Management Plan PCF-PD-EN-AQMP
- Construction Environmental Management Plan Air Quality Management Protocol 0000-ZA-E-09071
- Traffic Management Plan.
- Construction work complies with AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites.

Trigger and Threshold Criterion

Trigger Criterion:

- Dust deposition on threatened species habitat.

Threshold Criterion:

- Population decline, noticeable deaths during monitoring.
- Dust deposit impacts the health / condition of threatened species habitat.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Excessive dust on threatened species habitat is reported to the Environment and Heritage Manager.
- Investigate to determine the cause of the trigger criteria being exceeded and potential environmental impact that may occur due to the trigger criteria being exceeded.
- Undertake corrective actions to reduce dust emissions as identified through the investigation.
- Increase dust suppression activities.
- Undertake further education and awareness training to personnel.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 34

Project Ceres will minimise the risk of fire events related to Project activities so that biological diversity and ecological integrity are maintained.

Monitoring / Reporting Actions

Monitoring:

- A Bushfire Management Plan has been commissioned as part of the Development Approval from the City of Karratha.

- The management of fire at Project Ceres area will be in accordance with the Bushfire Management Plan, Fauna Management Plan, Flora Management Plan, Emergency Response Management Plan, and Fire Management Protocol, which include provisions to avoid where practicable and otherwise minimise impacts from fire on significant terrestrial fauna species, including short-range endemic fauna and migratory birds.
- Project Ceres development site will be cleared of vegetation during the construction phase. The western portion of Site F will be cleared to accommodate laydown and storage areas during the construction phase. Once construction is complete, these areas are expected to return to their natural vegetative state.
- A hot work permit procedure will be developed and implemented by Project Personnel.
- Smoking confined to designated smoking areas only.
- All vehicles, buildings, machinery and drill rigs will be fitted with fire extinguishers.
- Fire control equipment will be available in fire-risk areas including but not limited to hazardous material storage areas, hot works areas and service trucks.
- An adequate number of personnel will be trained in basic fire awareness, fire response and use of fire suppression equipment and on site at all times during Project Works.
- No open fires will be permitted on site at any time.
- Liaise regularly with the local government authorities regarding fire danger status.
- Maintenance on hot machinery will be undertaken in designated cleared areas whenever possible.
- Fire breaks will be established and maintained around key infrastructure and active construction sites.
- A dust suppression vehicle will be equipped such that it is capable of also being used as a fire response vehicle.
- Flammable and combustible materials are to be appropriately stored and isolated at all times in accordance with relevant Australian Standards.
- Compliance audits and inspections of work areas to ensure potential fuel loads are minimised.
- Regular inspections and testing of firefighting equipment will be conducted to ensure it is maintained in working order and in test.
- Vehicle undersides are to be regularly (e.g. at daily pre-starts, during and after use in spinifex areas etc.) checked for any material stuck around the exhaust system, and any identified material removed.
- Compliance audits and inspections.

Reporting:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.

- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Construction Manager

HSSE Manager

Supporting Documents

- Bushfire Management Plan
- Emergency Response Management Plan (CW1055600-EN-PL-004)
- Construction Environmental Management Plan Fire Management Protocol 0000-ZA-E-09071
- Confirmed Fauna Management Plan PCF-PD-EN- FaMP
- Confirmed Flora Management Plan PCF-PD-EN-FMP

Trigger and Threshold Criterion

Threshold Criterion:

- Fire spreading outside the boundaries of Project Ceres development envelope, affecting the native vegetation values in the Conservation zone in the Murujuga National Park.
- Impacts to relationship with MAC and local community.
- Loss of Fauna Habitat.
- Altered fire regimes result in increased loss or degradation of native vegetation and/ or flora due to fire impacts.

Trigger and Threshold and Contingency Actions

Threshold Contingency Actions:

- In the event of fire, or in the presence of smoke, personnel must implement the Emergency Response Management Plan to ensure:
- All personnel are alerted to the fire.
- Trained personnel use fire-fighting equipment to attempt to extinguish the fire.
- Emergency services are contacted.
- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Any threatened fauna deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW (and DBCA if death or injury to threatened fauna) within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW (and DBCA if death or injury to threatened fauna) within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Death or injury to threatened fauna to be treated as an incident.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Remediation to include:
  - Investigation to determine the condition and vegetation type impacted by fire, including the area impacted.
  - Determine the species likely to utilise the impacted habitats.

- Seek to provide habitat structures able to be utilised by impacted species or allow species to repopulate the impacted habitat.
- Monitor the effectiveness of the provided habitat structures through the presence / use by native fauna.
- Monitor regrowth and fauna presence until it is determined that the remediation activity has been successful and may cease.

- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 35

Project Ceres will avoid, where possible, and otherwise use best practice technology and risk-based management actions to minimise fauna entrapment.
Note: Removed due to duplication with Management Action 10.

Management Action 36

All fauna entrapped in egress will be removed and relocated by qualified personnel and handled in accordance with DBCA SOP's.

Monitoring / Reporting Actions

Monitoring:

- All excavations and fauna egress to be checked within 2 hours of sunrise if left open overnight.
- Fauna relocations shall be conducted by suitably qualified and experienced personnel.

Reporting:

- All fauna interactions to be recorded in the Fauna Interaction Register, including the name of the personnel conducting the relocation.
- Any threatened fauna or migratory bird species deaths and injuries will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened fauna or migratory bird species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Threatened species fauna interactions to be reported to DBCA annually in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Fauna interactions to be reported to DBCA annually in accordance with the Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Incidents reported through Monthly Project Environmental Reporting.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

• Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required. • Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded. • Provide a further report to the CEO, DCCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180. • CAR to the EPA in accordance with Condition 15-6 of MS 1180. • ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval. • EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.
Timing
• Monthly Project Environmental Reporting • CAR and ACR submitted annually. • EPR submitted every 5 years.
Responsibility
Environment and Heritage Manager
Supporting Documents
• Authorisation under Section 40 of the BC Act, TFA 2223-0317. • Regulation 28 Fauna Taking (Relocation) Licence FR28000358. • Fauna Management Plan (PCF-PD-EN-FaMP)
Trigger and Threshold Criterion
Trigger Criterion: • Fauna spotting activities conducted by inexperienced personnel. • Procedures for the relocation programs are not in accordance with DBCA SOP's prior to implementation. • DBCA SOP's not reviewed prior to program implementation.
Trigger and Threshold and Contingency Actions
Trigger Contingency Actions:

- Do not commence relocation of entrapped fauna until such time as there is a suitably qualified and experienced person available.
- Review and implement DBCA SOP's.

Management Action 37

Project Ceres will avoid, where possible, and otherwise use best practice technology and risk-based management actions to minimise threatened fauna poisoning caused by entrapment within contaminated holding ponds or exposure to chemicals used in the control of mosquitoes.

Monitoring / Reporting Actions

Monitoring:

- Where practicable avoid the use of larvicides and adulticides for chemical control of mosquitoes and other pest species.
- Should larvicide or adulticide be applied, Perdaman will develop a management plan to ensure the protection of native fauna. This plan will include the chemical make-up to be applied, the impacted areas, the seasons and timeframes for application, the potential impact of the chemicals on listed threatened and migratory species and mitigation measures for species' protection.

Reporting:

- The management plan will include record retention and reporting requirements, including a log of larvicide and adulticide used in Project Ceres area.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Chemical Register and MSDS to be reviewed annually.
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager
Supporting Documents
• Pest Management Sub-Plan 0000-ZA-E-09737 • Pest Management Plan PCF-PD-EN- PMP • Confirmed Fauna Management Plan PCF-PD-EN- FaMP • Project Environmental Management Plan PCF-PD-EN-PEMP
Trigger and Threshold Criterion
Threshold Criterion: • Fauna death associated with poisoning.
Trigger and Threshold and Contingency Actions

Threshold Contingency Actions:
• Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
• Any threatened fauna deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
• Injuries and deaths of threatened species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
• Where threshold criteria are exceeded:
  • Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  • Prepare an additional report to the CEO, DCCEEW and DBCA if within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  • Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  • Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
• Death or injury to threatened fauna to be treated as an incident.
• Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
• Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
• Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.

- Provide a further report to the CEO, CCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 38

Project Ceres will avoid, where possible, use best practice technology and risk-based management actions to minimise debris deposition (including litter and Urea dust) within the marine environment.

Monitoring / Reporting Actions

Monitoring:

- The prevention of debris impacting the marine environment will be achieved through implementation of the Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP, Air Quality Management Plan PCF-PD-EN-AQMP, and the Construction Environmental Management Plan 0000-ZA-E-09071.
- Weekly inspections of waste receptacles, stockpiles and chemical storage areas to ensure no contaminated substances or wastes are deposited in the marine environment.
- Inspection of bunding around stockpiles and chemical storage units to prevent discharges.
- Weekly inspections of urea dust deposition around the conveyor and urea transport routes.
- Personnel training and competency records monitored to ensure capabilities present for spill response actions or identification of hazards / incidents relating to solid and liquid wastes.

Reporting:

- Spills, contaminated run-off, or fauna deaths associated with poisoning reported as an incident.
- Incidents reporting in Monthly Environmental Report.
- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Any threatened fauna deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW (and DBCA if death or injury to threatened fauna) within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW (and DBCA if death or injury to threatened fauna) within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Weekly inspections.
- Ongoing throughout the life of Project Ceres.
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manager

Supporting Documents

- Authorisation under Section 40 of the BC Act, TFA 2223-0317.
- Regulation 28 Fauna Taking (Relocation) Licence FR28000358.
- Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP
- Air Quality Management Plan PCF-PD-EN-AQMP
- Construction Environmental Management Plan 0000-ZA-E-09071.
- Confirmed Surface Water Management Plan PCF-PD-EN-SWMP

Trigger and Threshold Criterion

Trigger Criterion:

- Debris is not contained within Project Ceres area and is deposited in the marine environment

Threshold Criterion:

- Fauna death associated with debris deposition in the marine environment.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Review the requirements of the relevant management plans to ensure all mitigation strategies are implemented.
- Review procedures in place for the prevention of deposition of debris in the marine environment and develop and implement further controls where required.

Threshold Contingency Actions:

- Injured native fauna to be taken to Pilbara Wildlife Carers Association (0438 924 842).
- Any threatened fauna deaths and injuries will be reported to the DBCA in accordance with BC Act Section 40 Authorisation TFA 2223-0317.
- Injuries and deaths of threatened species reported as an incident and reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO, DCCEEW and DBCA within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO, DCCEEW and DBCA if within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Death or injury to threatened fauna to be treated as an incident.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO, CCEEW and DBCA within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 39

Spills of chemicals, hazardous materials and wastewater will be prevented from impacting the marine and terrestrial environments.

Monitoring / Reporting Actions

Monitoring:

- Spill prevention and management will be in accordance with the Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol and Hydrocarbons and Hazardous Substances Management Protocol 0000-ZA-E-09071; Confirmed Surface Water Management Plan PCF-PD-EN-SWMP; and Project Emergency Preparedness & Response Plan 0000-ZA-E-09711.
- The Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol and Hydrocarbons and Hazardous Substances Management Protocol 0000-ZA-E-09071 will be updated to include any Part V conditions around discharges, storage of chemicals and fuels, refuelling and spill management upon approvals and licenses being issued by DWER.
- Environmental inspections to ensure the integrity of storage facilities and the proper storage requirements are being adhered to in accordance with the relevant Australian Standards.
- Storage of chemicals and hazardous materials shall not be permitted in the supratidal areas or other areas prone to flooding or drainage/runoff. A hazardous material no-go laydown zone map will be developed during the preparation of the emergency response plan.
- All surface water discharges on site will be diverted to a purpose-built stormwater facility for containment, treatment and reuse on site.
- Permanent infrastructure and laydown areas will avoid the higher, steeper areas along the southern boundary of the development envelope and will benefit from perimeter drainage.
- Run-off will be diverted into appropriate clean water and contaminated water catchment ponds for treatment and subsequent discharge or disposal. Surface water ponds will all benefit from oil interceptors.
- Compliance audits and inspections in accordance with the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.
- Monitoring effectiveness of management measures via Incident report forms.

Reporting:

- A spill or seepage of chemicals, hazardous materials and wastewater, including urea, ammonia, acid gas products to air or terrestrial or marine environments that exceed threshold criteria in the Air Quality Management Plan PCF-PD-EN-AQMP or the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP reported as an incident.
- Incidents reported in Monthly Environmental Report.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.

- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manger

All personnel

Supporting Documents

- Air Quality Management Plan PCF-PD-EN-AQMP
- Confirmed Surface Water Management Plan PCF-PD-EN-SWMP
- Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol and Hydrocarbons and Hazardous Substances Management Protocol 0000-ZA-E-09071
- Project Emergency Preparedness & Response Plan 0000-ZA-E-09711

Trigger and Threshold Criterion

Trigger criteria:

- Spills or seepage of urea, ammonia, acid gas products in air emissions or liquid forms that are contained within Project Ceres area and do not impact marine and terrestrial environments.

Threshold Criterion:

- A spill or seepage of chemicals, hazardous materials and wastewater, including urea, ammonia, acid gas products to air or terrestrial or marine environments that exceed threshold criteria in the Air Quality Management Plan PCF-PD-EN-AQMP or the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Notify the Environment and Heritage Manager of the leak or spill immediately upon identification and clean up in a safe manner in line with spill response procedures.
- Review competency and training registers and provide further training regarding waste management, leaks and spills to relevant personnel.
- Monitor the implementation of the required monitoring programs relevant to liquid waste and air pollutant deposition.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 40

Spills (overflow) and seepage from brine storage pond and evaporative storage pond will be prevented from impacting the marine and terrestrial environments.

Monitoring / Reporting Actions

Monitoring:

- Management and prevention of spills via overflow from the brine storage pond or evaporative storage pond will be in accordance with the Surface Water Management Plan, Spill Response Procedure, Erosion, Sediment and Surface Water Quality Management Protocol and Hydrocarbons and Hazardous Substances Management Protocol.
- The management protocol's will be updated to include any Part V conditions upon approvals and licenses being issued by DWER.
- Inspections of the capacity and operational integrity of the brine and evaporative storage pond.
- Inspections of storage, transfer and loading areas for urea spills and water leaks that may impact urea condition.
- Monitoring effectiveness of management measures via Incident report forms.

Reporting:

- Spills via overflow from the brine storage pond or evaporative storage pond as an incident.

- Incidents reported in Monthly Environmental Report.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Weekly inspections brine and evaporative storage pond (increase to daily during heavy and prolonged rainfall).
- Daily inspections of urea handling areas.
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manger

All personnel

Supporting Documents

- Confirmed Surface Water Management Plan PCF-PD-EN-SWMP
- Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol 0000-ZA-E-09071

- Project Emergency Preparedness & Response Plan 0000-ZA-E-09711

Trigger and Threshold Criterion

Trigger criteria:

- Water leaks threatening contamination of urea product.
- Hold ponds nearing capacity limits.
- Daily inspection checklist not completed.
- Monitoring not conducted / missing.

Threshold Criterion:

- Spills and / or seepage from brine and / or evaporative storage pond.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Notify Environment and Heritage Manager of the leaks threatening urea product and implement controls to stop the current leak and possible future leaks.
- Discharging of waters in an appropriate manner to increase hold pond capacity, especially during the wet season and in light of future heavy rain events.
- Complete the missing inspection checklist as soon as practicable and to the furthest extent possible.
- Monitor the implementation of the required monitoring until personnel have provided confidence to the supervising bodies in completing monitoring correctly without supervision.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.

- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 41

Spills of hydrocarbons will be prevented from impacting the marine and terrestrial environments.

Monitoring / Reporting Actions

Monitoring:

- Hydrocarbon spill prevention and management will be in accordance with the Construction Environmental Management Plan, Erosion, Sediment and Surface Water Quality Management Protocol, Spill Response Procedure, Surface Water Management Plan and Hydrocarbons and Hazardous Substances Management Protocol.
- The Surface Water Quality Management Protocol will be updated to include any Part V conditions around discharges, storage of chemicals and fuels, refuelling and spill management upon approvals and licenses being issued by DWER.
- Environmental inspections to ensure the integrity of storage facilities and the proper storage requirements are being adhered to in accordance with the relevant Australian Standards.
- Storage of hydrocarbons shall not be permitted in the supratidal areas or other areas prone to flooding or drainage/runoff.
- All surface water discharges on site will be diverted to a purpose-built stormwater facility for containment, treatment and reuse on site.
- Where possible, permanent infrastructure and laydown areas will avoid the higher, steeper areas along the southern boundary of the development envelope.
- Run-off will be diverted into appropriate storage units
- Compliance audits and inspections in accordance with the Surface Water Management Plan.
- Monitoring effectiveness of management measures via Incident report forms.

Reporting:

- Spills via overflow from the brine storage pond or evaporative storage pond as an incident.
- Incidents reported in Monthly Environmental Report.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.

• Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded. • Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180. • CAR to the EPA in accordance with Condition 15-6 of MS 1180. • ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval. • EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.
Timing
• Weekly inspections brine and evaporative storage pond (increase to daily during heavy and prolonged rainfall). • Daily inspections of urea handling areas. • Monthly Project Environmental Reporting • CAR and ACR submitted annually. • EPR submitted every 5 years.
Responsibility
Environment and Heritage Manger
Supporting Documents
• Confirmed Surface Water Management Plan PCF-PD-EN-SWMP • Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol and Hydrocarbons and Hazardous Substances Management Protocol 0000-ZA-E-09071 • Project Emergency Preparedness & Response Plan 0000-ZA-E-09711
Trigger and Threshold Criterion
Trigger criteria: • Spill of hydrocarbons that is contained within Project Ceres area and does not impact marine and terrestrial environments. Threshold Criterion: • Spills of hydrocarbons that impacts the marine or terrestrial environments.
Trigger and Threshold and Contingency Actions
Trigger Contingency Actions:

- Notify Environment and Heritage Manager of hydrocarbon spill and implement controls to control the spill, contain the hazard, and clean up the spill and any damage.
- Review competency and training registers and provide further training regarding waste management, leaks and spills to relevant personnel.
- Monitor the implementation of the required monitoring programs relevant to hydrocarbon management.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 42

Prevent the degradation of marine water quality due to construction activities (i.e. soil movements, construction of causeway, increased traffic movements while constructing Port facilities).

Monitoring / Reporting Actions

Subject to Pilbara Ports Authority Approval requirements (to be issued) – this section will be updated upon issuing of the approval.

Monitoring:

- The maintenance of marine water quality will be in accordance with the approval granted by the Pilbara Ports Authority.
- Impacts on marine water quality will be monitored and managed in accordance with the Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol 0000-ZA-E-09071, and the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.

Timing
• Subject to Pilbara Ports Authority Approval requirements
Responsibility
Environment and Heritage Manger
Supporting Documents
• Confirmed Surface Water Management Plan PCF-PD-EN-SWMP • Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol 0000-ZA-E-09071 • Pilbara Ports Authority Approval
Trigger and Threshold Criterion
• Subject to Pilbara Ports Authority Approval Requirements– this section will be updated upon issuing of the approval.
Trigger and Threshold and Contingency Actions
• Subject to Pilbara Ports Authority Approval Requirements– this section will be updated upon issuing of the approval.
Management Action 43
Monitoring of Multi User Brine Return Line water quality.
Monitoring / Reporting Actions

Monitoring:
• Undertake periodic water quality monitoring of plant process water and treated wastewater prior to discharge to the Multi User Brine Release Line (MUBRL) in accordance with Ministerial Statements 567 and 594, Part V Licence and Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP.
Reporting:
• Where threshold criteria are exceeded:
  • Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  • Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  • Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  • Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.

- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Monitoring frequency in accordance with Part V approval.
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manger

Process Manager

Supporting Documents

- Ministerial Statements 567 and 594
- Part V Licence
- Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP

Trigger and Threshold Criterion

Trigger criteria:

- Saline water (Brine) does not meet the MUBRL discharge specification.
- Liquid waste not treated or reused on site requiring disposal.

Threshold Criterion:

- Exceedance of Indicative Wastewater Acceptance Criteria to MUBRL for Project Ceres.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Saline water (Brine) which does not meet the MUBRL discharge specification will be sent to the brine evaporation pond. Solid waste from this area will be removed off site by an appropriately licensed waste contractor and disposed of at a licensed waste facility, suitable for this waste's classification.
- Management of brine in accordance with the Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP

Threshold Contingency Actions:

- Cease all discharges to the MUBRL.
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 44

Project Ceres will be designed, constructed and operated to maintain the quality of groundwater and surface water so that environmental values are protected.

Monitoring / Reporting Actions

Monitoring:

- Changes in surface water quality will be monitored and managed in accordance with the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.

- Potential impacts on groundwater levels and quality and subsequent management requirements due to the disturbance of acid sulphate soils are managed through Project Environmental Management Plan PCF-PD-EN-PEMP and the Acid Sulphate Soils Management Plan PCF-PD-EN-ASSMP.
- Erosion and sediment control measures are provided in the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP and the Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol 0000-ZA-E-09071
- The Confirmed Surface Water Management Plan PCF-PD-EN-SWMP provides a framework which describes how Project Ceres will address, manage, monitor and mitigate impacts to surface water and receiving waterways during construction, operation and decommissioning phases of Project Ceres in accordance with the applicable regulatory requirements, permit obligations and industry best practice.

Reporting:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Surface Water Monitoring:
  - Monthly in construction zones
  - Biannually post construction
- Groundwater Monitoring:
  - Weekly in active dewatering zones.
  - Monthly in construction zones.
  - Quarterly in all other areas (March, June, September and December).
- Surface water flows to Supratidal flats

- Immediately after significant rainfall events (over 15 mm rainfall), and then daily for three days while standing water is present.
- Once annually in February, immediately after a significant rainfall event (over 15 mm rainfall), and then daily for three days while standing water is present.

- Vegetation on supratidal flats and King Bay Mangrove Communities reliant on hydrological regimes.
  - Annually in Spring
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manger

Supporting Documents

- Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.
- Project Environmental Management Plan PCF-PD-EN-PEMP
- Acid Sulphate Soils Management Plan PCF-PD-EN-ASSMP
- Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol 0000-ZA-E-09071

Trigger and Threshold Criterion

Trigger criteria:

- Exceedance of water quality trigger levels as provided in the Surface Water Management Plan.
- Exceedance of supratidal flat (Samphire Shrublands) and King Bay Mangrove Community Vegetation Assemblages Stress Level 2.

Threshold Criterion:

- Exceedance of water quality threshold levels as provided in the Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.
- Exceedance of supratidal flat and King Bay Mangrove Community Vegetation Assemblages Stress Level 3.

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Investigate the cause of exceedance.
- Identify additional measures to prevent trigger levels being exceeded in the future and to prevent reaching threshold.

- Conduct detailed survey of the assemblage monitoring location as soon as practicable and review the result no later than one week following the detailed survey.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 45

Brine which does not meet the MUBRL discharge specification will be sent to the brine evaporation pond.

Note: Removed due to duplication with Management Action 43

Management Action 46

Project Ceres will avoid, where possible, and otherwise use best practice technology and risk-based management actions to prevent contaminated stormwater discharging off site.

Where practicable, the site's clean stormwater will be reused within the process plant.

Stormwater potentially contaminated by spills or leaks from process activities (first flush) will be directed to a dedicated sump and then pumped to the saline water pond for pre-treatment, prior to being discharged to the MUBRL or evaporated in an evaporation pond.

Monitoring / Reporting Actions

Monitoring:

- Regular inspections and audits of stormwater management including sediment basins and ponds.
- Where possible stormwater will be captured and used for construction activities

- Potentially contaminated stormwater will not be discharged into the environment.
- Monitoring of water quality in accordance with the Surface Water Management Plan.
- Weekly inspections of the surface water diversions, ensuring all run-off sources are diverted to appropriate hold ponds treated according to the potential contaminants therein

Reporting:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing

- Weekly monitoring of stormwater collection ponds during rainy season
- Inspection of stormwater ponds during a rain event
- Monthly Project Environmental Reporting
- CAR and ACR submitted annually.
- EPR submitted every 5 years.

Responsibility

Environment and Heritage Manger

Process Engineer

Supporting Documents

- Confirmed Surface Water Management Plan PCF-PD-EN-SWMP.
- Solid & Liquid Waste Management Plan PCF-PD-EN-SLWMP.

Trigger and Threshold Criterion

Trigger criteria:

- Notable hydrocarbon iridescent sheen within stormwater collection ponds and ponds reaching 75% capacity.

Threshold Criterion:

- Exceedance of water quality trigger levels as provided in the Surface Water Management Plan, stormwater ponds reached 100% capacity and discharging via the emergency spillway / perimeter drains

Trigger and Threshold and Contingency Actions

Trigger Contingency Actions:

- Investigate the source of hydrocarbon contamination.
- Inspect operation of the oil skimmer in stormwater pond to ensure effectiveness.
- Commence transfer of contaminated water to brine ponds and/or evaporation ponds.
- All requirements of Confirmed Surface Water Management Plan PCF-PD-EN-SWMP (contaminated surface water) are to be implemented.

Threshold Contingency Actions:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.

- Undertake further education and awareness training to personnel.
- Consult with MAC.

Management Action 47

Project Ceres will be designed, constructed, and operated to maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.

Monitoring / Reporting Actions

Monitoring:

- Visual inspection and measurement of backwater or ponding of water.
- Hydrological monitoring at sites SW1 through to SW6 in accordance with the Surface Water Management Plan.
- Monitoring of surface outflow velocities at the culverts of the causeway.
- The causeway will be built up above the supra-tidal flat area to a road height of approximately 6m AHD with regular culverts to ensure the structure does not impede natural surface water or tidal flows.
- Monitoring of the construction schedule for the causeway to ensure schedule of works will be completed in the shortest time practicable to minimise impacts to the supratidal flats, King Bay and the King Bay Mangrove Community from obstructed surface water flows.
- Supplementary hydrogeological studies are to be conducted prior to commencement of construction, to confirm details of groundwater quality, groundwater flow directions, and the depth to groundwater beneath Sites C and F and in the surrounding areas and install groundwater monitoring bores to ensure groundwater contamination can be readily detected and appropriate management measures be implemented.

Reporting:

- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Implement the management and/or contingency specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- CAR to the EPA in accordance with Condition 15-6 of MS 1180.
- ACR submitted to the DCCEEW in accordance with Condition 17 of the EPBC Act Approval.
- EPR submitted to the Minister and the Murujuga Aboriginal Corporation in accordance with Condition 12 of MS 1180.

Timing
• Monitoring of surface water flows to supratidal flats to occur immediately after significant rainfall events (over 15 mm rainfall), and daily for three days while standing water is present. • Monthly Project Environmental Reporting • CAR and ACR submitted annually. • EPR submitted every 5 years.
Responsibility
Environment and Heritage Manger
Supporting Documents
• Confirmed Surface Water Management Plan PCF-PD-EN-SWMP. • Project Environmental Management Plan (PCF-PD-EN-PEMP) • Construction Environmental Management Plan Water Quality, Erosion and Sediment Control Protocol 0000-ZA-E-09071
Trigger and Threshold Criterion
Trigger criteria: • Presence of backwater or ponding of water from the edge of the development envelope over a period of two (2) consecutive days from the date ponding was identified at distances further than 6m. Threshold Criterion: • Presence of backwater or ponding of water from the edge of the development envelope over a period of two (2) consecutive days from the date ponding was identified at distances further than 10 m. • Culvert outflow velocities exceeding 1m/s.
Trigger and Threshold and Contingency Actions
Trigger Contingency Actions: • Investigate if cause of the change is due to the construction or operation of Project Ceres. • Identify additional measures to prevent the trigger level being exceeded in the future and to prevent reaching threshold. • Review of the drainage design including flow paths that run across the development envelope into adjacent supratidal flats located downstream from the development envelope. Threshold Contingency Actions: • Investigate if cause of the change is due to the construction or operation of Project Ceres.

- Identify additional measures to prevent the trigger level being exceeded in the future and to prevent reaching threshold.
- Review of the drainage design including flow paths that run across the development envelope into adjacent supratidal flats located downstream from the development envelope
- Where threshold criteria are exceeded:
  - Report the exceedance in writing to the CEO and the DCCEEW within seven days of the exceedance being identified in accordance with Condition 5-6 (1) of MS 1180.
  - Prepare an additional report to the CEO and the DCCEEW within twenty-one (21) days of the exceedance being reported as required by Condition 5-6 (5) of MS 1180.
  - Within 6 months of any exceedance of a threshold criterion, submit to the DCCEEW for the Minister's approval a Remediation Plan in accordance with Condition 3(b) of the EPBC Act Approval.
  - Submit an Offset Strategy within 10 months of the exceedance of threshold criterion in accordance with Condition 3(c) of the EPBC Act Approval, as required.
- Incidents reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.
- Implement the management and/or contingency actions specified in the relevant management plans within seven days of the exceedances being reported and continue implementation unto the CEO has confirmed that the threshold criteria are being met and implementation and/or contingency actions are no longer required.
- Investigate to determine the cause of the threshold criteria being exceeded, and to provide information to the CEO to determine potential environmental harm or alteration of the environment that occurred due to the threshold criteria being exceeded.
- Provide a further report to the CEO and DCCEEW (and DBCA if death or injury to threatened fauna) within 21 days of the exceedance being reported in accordance with Condition 5-6 (5) of MS 1180.
- Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with EPA, DWER and DCCEEW.
- Undertake further education and awareness training to personnel.
- Consult with MAC.

8.1 Additional Mitigation Strategies for Implementation for Night Works During Construction and Commissioning

The following mitigation strategies are incorporated into the Contractor Construction Environmental Management Plan 0000-ZA-E-09071.

Night Parrot (Pezoporus occidentalis)

- To limit any possibility that night parrots (and other native fauna) are attracted to the project site, it is recommended limiting the availability of standing water on the project site as birds may be attracted to the water source.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species whilst driving at night and the importance of observing the speed limit.
- Minimise impulsive noise (banging tail gates, loud hammering etc.) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered.

Northern Quoll (Dasyurus hallicatus)

- Impose strict speed restrictions of 40km/hr for all site vehicles between dusk and dawn. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species whilst driving at night and the importance of observing the speed limit.
- Minimise impulsive noise (banging tail gates, loud hammering etc.) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered.
- Ensure food scraps/rubbish is contained securely on site and disposed of responsibly.

Pilbara Olive Python (Liasis olivaceus barroni)

- Impose strict speed restrictions of 40km/hr for all site vehicles between dusk and dawn. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species
- Minimise impulsive noise (banging tail gates, loud hammering etc.) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered. This mitigation is especially important for this species.
- Where possible, target any drilling activities away from the periphery of the project during nighttime hours, with consideration given to adjacent rock stacks where Pilbara olive pythons may inhabit. This mitigation is especially important for this species.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.

- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species whilst driving at night and the importance of observing the speed limit.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as this causes the most disturbance to nocturnal wildlife.
- To limit any possibility that native fauna are attracted to the project site, it is recommended limiting the availability of standing water on the project site.

Ghost bat (Macroderma gigas), Pilbara leaf-nosed bat (Rhinonicteris aurantia), Northern Coastal Free-tailed Bat (Ozimops cobourgianus)

- Impose strict speed restrictions of 40km/hr for all site vehicles between dusk and dawn. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- During dry weather, ensure dust suppression is in place to reduce any potential impacts from excessive dust production.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Reduce the use of mesh and barbed wire fences on the project site, limiting the likelihood bats will be impacted by fencing.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened whilst driving at night and the importance of observing the speed limit.

Bilby (Macrotis lagotis)

- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species whilst driving at night and the importance of observing the speed limit.
- Minimise impulsive noise (banging tail gates, loud hammering etc.) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered.

Migratory Shorebirds

- Impose strict speed restrictions of 40km/hr for all site vehicles between dusk and dawn. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species. Reduced speed limits may also reduce impacts of noise on any foraging shorebirds.

- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Where possible, limit works that produce impulsive noise (loud spontaneous noise – truck and trailer tail gates banging etc.), to the dry season or as far away from the supratidal area as possible.
- Where possible, limit works or transit on the proposed road through the supratidal zone to daytime hours during the wet season.

9 Training and Awareness

All Project personnel shall be aware of and competent to implement the environmental requirements of the TSMP when performing their individual tasks. A competent person is a person who is qualified, because of knowledge, training and experience, to organise the work and its performance.

9.1 Project Inductions

Prior to commencing any work on site, all personnel working on Project Ceres will undertake an environmental induction which will include Project Ceres's aspects, impacts and mitigations for the protection of threatened species. The environmental induction developed by Perdaman, will be delivered to personnel by the Environmental Representative, or delegated person, and shall include, but not be limited to the following:

- Project approvals and associated conditions.
- Key legal obligations.
- Regulatory penalties and impacts of non-compliance.
- Process for authorising ground disturbance via the GDP process.
- Land access restrictions.
- Aboriginal heritage sites and cultural awareness.
- Dust management.
- Identification of weeds, management measures and reporting requirements.
- Protection of fauna, identification of threatened fauna species and reporting requirements (sightings andinjuries).
- Identification of feral fauna species and reporting requirements.
- Water management and water use efficiency.
- Fire risk management and response.
- Erosion systems and management.
- Hazardous materials storage and use.
- Spill management including use of spill kits.
- Waste management.
- Asbestos materials management.
- Emissions management.
- Incident and hazard reporting.
- Any special requirements relevant to specific work locations e.g.: Port related aspects and impacts.

To mitigate potential impacts to threatened species from night works, a Night Works Induction shall be prepared and implemented prior to the commencement of night work activities, to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species whilst driving at night and the importance of observing the speed limit.

9.2 Training Records

Training records shall be maintained on site and include the following as a minimum:

- Records of training attendance e.g.: induction training, toolbox meetings.

- Copies of training materials.
- Competency assessments (where relevant).
- Training matrix.

9.3 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 sensitivevalues.

The GDP provides Project Ceres 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 Project Ceres.

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.

10 Stakeholder Consultation

This Confirmed Threatened Species Management Plan (PCF-PD-EN-TSMP) was prepared in consultation with Murujuga Aboriginal Corporation (MAC) in accordance with Condition 5-3 of MS 1180. Reviews and revision of the TSMP will be done in consultation with MAC, with submissions to be sent to the CEO and the DCCEEW.
Perdaman shall provide for the relevant traditional owners to be invited to observe any Ground Disturbing Activities and during construction activities and take reasonable steps to facilitate the observation of those activities by those persons.
Perdaman has carried out stakeholder consultation with key stakeholders since February 2019 to enable the development of Management Plans. A consultation register summarising consultation is presented in Appendix 2. The register summarises the consultation and Perdaman responses, and the most recent consultations with the Murujuga Aboriginal Corporation are included as Attachment D, Attachment E, Attachment F, and Attachment G of this plan.

10.1 Internal and External Communication

Regular updates of environmental issues and related matters will be communicated to all Project personnel. This communication will include the induction process, through regular team meetings and toolbox talks, and via written communications including emails and newsletters disseminated electronically or in hard copy.

All external communications will be managed by Project Ceres Director. No other Project personnel or Contractorsare to provide comment or information to external organisations or individuals without the consent of Project CeresDirector.

10.2 External Incident Notification

Only the Environment and Heritage Manager, in consultation with Project Ceres Director, is authorised to notify external regulatory agencies of any Project related environmental incidents.

This communication will be in accordance with individual agencies' reporting and notification requirements.

11 Non-Conformance and Incident Management

11.1 Environmental Incident Response

An environmental incident on Project Ceres that could impact threatened species, is any situation where a gas,liquid or solid emission release occurs that does, or could, pose a threat to environmental values, or be a breach of a Project approval or regulatory requirement. As a guide, this could include:

- Spill to open ground, waterway or marine system of a known or potentially contaminating liquid or solidmaterial.
- Clearing or grubbing vegetation outside an approved area.
- Release of gas or vapours to atmosphere.
- Injury or death of fauna.
- Introducing weed contaminated soil or vegetation into uninfected areas.
- Erosion or deposition of sediment outside Project Ceres's battery limits.
- Any uncontrolled fire.
- Uncovering naturally occurring hazardous or contaminating materials such as acid sulphate soils.
- Excessive dust generation.
- Excessive noise emissions.
- Waste not being stored, managed or disposed of appropriately.

The immediate response to all incidents is to make the area safe and undertake measures to prevent further environmental harm.

The process outlined in Figure 11-1 below will be followed by all Project personnel if an environmental incident occurs.

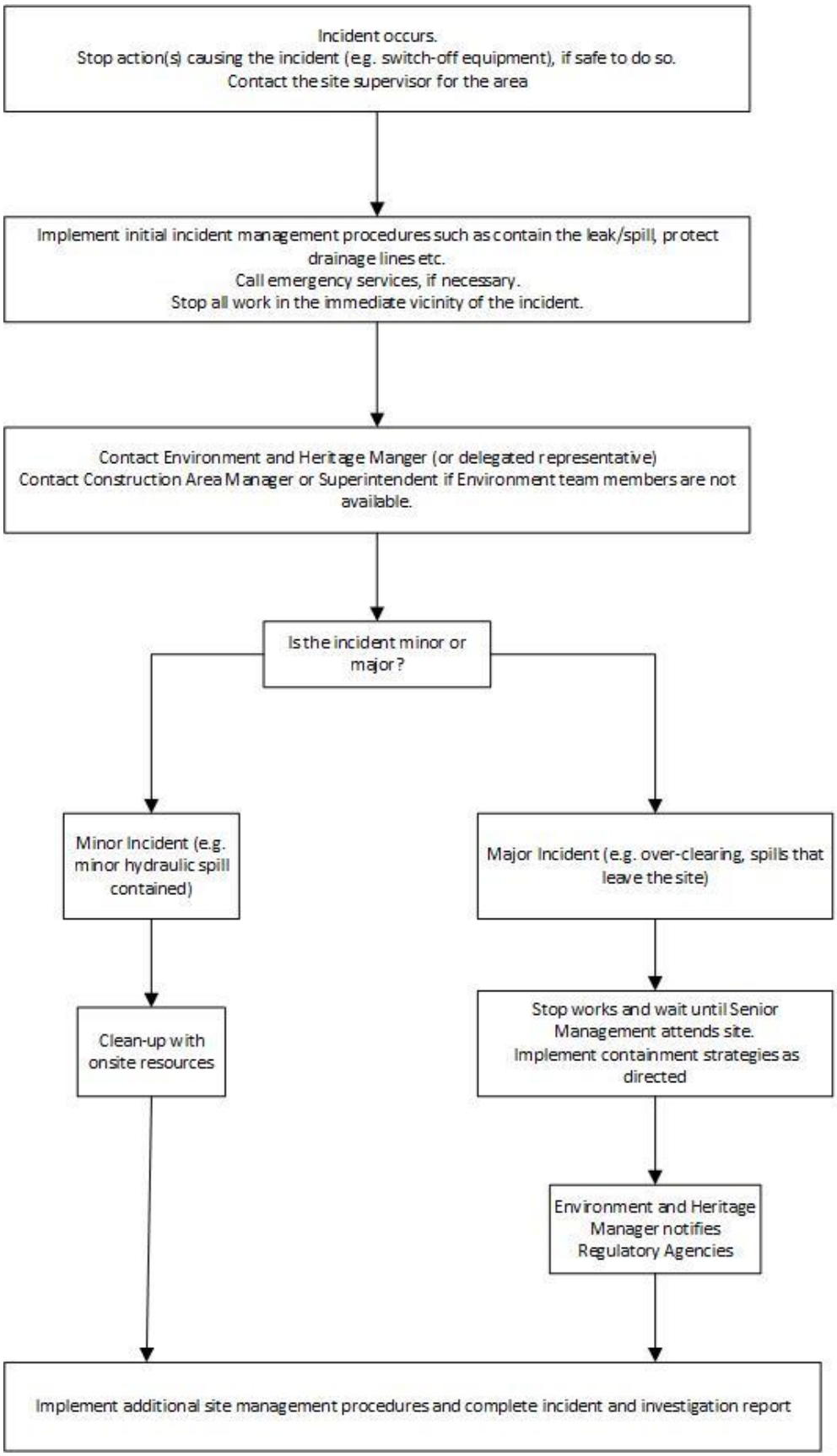


Figure 11-1 Flow Chart for Environmental Incident Response

11.2 Incident Reporting and Investigation

When an environmental incident occurs, regardless of its scale or nature, the Environment and Heritage Manager (or their representative) is to be notified of the incident as soon as possible.

The Environment and Heritage Manager will inform Project Ceres Director of the incident, and actions taken to mitigate impact to the environment. Reporting to Project Ceres Director must occur within 24 hours. The incident and response will be recorded in Perdaman's incident reporting system, within 24 hours of occurrence.

For externally reportable and / or high potential incidents, root cause(s) must be established using the IncidentCause Analysis Methodology (ICAM). The final incident investigation report must be submitted within 14 days,or as stipulated by Project Ceres Director, depending on the level of investigation required.

In the event that an environmental incident results in the offsite discharge of contaminants to the environment,the Environment and Heritage Manager, in consultation with Project Ceres Director, will contact the appropriate regulatory agencies.

All high-potential environmental releases must be reported to the Perdaman Chairman within 24 hours of occurrence, or sooner if practicable.

The site supervisor responsible for the area in which the incident occurred is to complete an incident report form and provide it to the Environment and Heritage Manager as soon as practicable after the incident.

Depending on the nature of the incident, reporting and notification of incidents may need to be provided to external agencies or Regulators.

All incidents will be investigated at a level commensurate with the actual or potential consequence. Incidents with an actual consequence of high and above, including those that breach regulations, licence or approval conditions will include the relevant Construction or Operations Manager in the incident's investigation.

Table 8-1 includes management actions, where failure to comply with that action constitutes an incident. Where this occurs, these incidents are to be reported in writing to the DCCEEW as soon as practicable and no later than two business days after becoming aware of the incident, in accordance with Condition 18 of the EPBC Act Approval. Further details of the incident to be provided within 10 days of the incident, in accordance with Condition 19 of the EPBC Act Approval.

In accordance with the BC Act Section 40 Authorisation TFA 2223-0317, any threatened fauna injuries, unexpected deaths, unplanned euthanasia, and abandoned young or eggs must be reported to DBCA as an incident.

11.3 Non-Conformance Management

In the event that the environmental outcomes specified in Conditions 5-1 of MS 1180 (refer to Section 2) are exceeded, or monitoring or investigations at any time indicate an exceedance of threshold criteria specified in this plan, the following actions will be taken in accordance with Condition 5-6 MS 1180:

1. Exceedance to be reported in writing to the CEO of the EPA and the Department of Agriculture, Water and the Environment (DAWE) (now Department of Climate Change, the Environment, Energy and Water, DCCEEW) within 7 days of the exceedance being identified.
2. Implement the management and/or contingency actions specified in **Table 8-1** of this Plan within 7 days of the exceedances being reported in accordance with Item 1 and continue implementation of those actions until the CEO of the EPA has confirmed by notice in writing that it has been demonstrated that the threshold criteria are being met and implementation of the management and/or contingency actions are no longer required.
3. Investigate to determine the cause of the threshold criteria being exceeded.

4. Investigate to provide information for the CEO to determine potential environmental harm or alteration of the environment that occurred due to threshold criteria being exceeded.
5. Provide a further report to the CEO of EPA and the DCCEEW within 21 days of the exceedance being reported as required by Item 1 which report shall include:
    a. details of management and/or contingency actions implemented.
    b. the effectiveness of the management and/or contingency actions implemented against the threshold criteria.
    c. the findings of the investigations required by Item 3 and Item 4.
    d. measures to prevent the threshold criteria being exceeded in the future.
    e. measures to prevent, control or abate the environmental harm which may have occurred; and
    f. justification of the threshold criteria remaining, or being adjusted based on better understanding, demonstrating that outcomes will continue to be met.

In accordance with the EPBC Act Approval, in the event that Perdaman becomes aware of any exceedance of a threshold criterion specified in the Threatened Species Management Plan, Perdaman must implement the following:

1. Undertake the actions required under condition 5-6 of the Western Australian Approval (MS 1180) and include an assessment of any impact(s) to protected matters arising from the exceedance.
2. Within 6 months of any exceedance of a threshold criterion, submit to the Department for the Minister's approval a Remediation Plan for any impact(s) to protected matters arising from the exceedance as detailed in the report required under condition 5-6(5) of the Western Australian Approval, that has been reviewed by an independent suitably qualified expert.
3. If the Minister determines that it is not possible to remediate the impact(s) of one or more exceedance, then the approval holder must submit an Offset Strategy for the Minister's approval, within 10 months of exceedance of the threshold criterion. The offset strategy must specify how the impact(s) will be offset in accordance with the requirements of the Environmental Offsets Policy.
4. If the Offset Strategy has not been approved by the Minister in writing within 11 months of any exceedance of a threshold criterion, and the Minister notifies the approval holder that the Offset Strategy is not suitable for approval, the Minister may approve a version of the Offset Strategy revised by the Department. The approval holder must implement the approved Offset Strategy for the life of Project Ceres

Where the threshold criterion is in relation to threatened fauna injuries, unexpected deaths, unplanned euthanasia, and abandoned young or eggs, reports prepared for the CEO and DCCEEW must also be provided to the DBCA.

Non-conformances may be identified from a number of sources, including but not limited to incident investigations, audits, inspections, monitoring programs and management reviews. Corrective actions will be systematically implemented and reviewed to ensure they adequately resolve the issue and minimise the risk of reoccurrence of the incident.

A corrective action register shall be maintained on site by Perdaman and shall record all corrective actions identified and implemented, including review of corrective actions and close out details. The close out details shall include the date closed and the name of the person verifying completion of the required action.

Corrective actions where the initial risk level is high or extreme must be prioritised and closed in a timely manner.

Where relevant, corrective actions identified may be included in periodic revision of the PEMP.

In addition, if an Environmental Performance Report identifies any changes to the state of any matters

listed in condition 12-3 of the MS 1180, which affect one or more EPBC Act protected matter(s), treat the relevant findings of the Environmental Performance Report as an exceedance of a threshold criterion(s) specified in the Threatened Species Management Plan, as per condition 7b of the EPBC approval.

11.4 Emergency Management

Project Ceres's PCF-PD-PN-ERMP Emergency Response Management Plan shall be implemented, addressinghealth, safety and environmental issues. The plan will include methods for managing major environmental incidents, including but not limited to, large scale release of hazardous materials or gases, fire, cyclone and flood events.

12 Environmental Monitoring and Reporting

Perdaman shall conduct regular inspections and audits of Project Ceres's work sites and undertake monitoring and reporting of specific environmental aspects and impacts in accordance with the requirements of Table 8-1.

All non-conformances identified will be managed through Project Ceres's non-conformance managementprocess outlined in Section 11.3.

Regularly monitoring of the effectiveness of the mitigation measures over time allows the TSMP to be adapted if performance criteria are not met. The following sections detail the monitoring activities and reporting requirements for Project Ceres.

12.1 Pre-clearance survey

Animal Plant Mineral (APM) was engaged to carry out desktop and field surveys of terrestrial flora and fauna. The survey is described in detail in Section 4.1 and is provided in Attachment B.

The aims of the desktop survey were to:

- Establish the fauna assemblage previously determined for the site and the region.
- Identify species previously determined as present on site including Threatened and Priority Fauna
  under the provisions of the BC Act and EPBC Act).
- Identify species previously determined as present on site regarded as being "significant" at both local and regional scales.
- Identify habitat types previously determined as present on site regarded as being "significant" at both local and regional scales; and
- Identify introduced species previously determined as present on site.

The desktop study included database searches, including:

- Australian Government Protected Matters Search Tool (DCCEEW)
- Atlas of Living Australia
- NatureMap (DBCA)
- Threatened Fauna Database (DBCA)
- Review of existing fauna surveys and investigations within the Burrup Peninsula and Surrounds Relevant to Project Ceres.

Trace Archaeology and Ecology (Trace) carried out a Supplementary Baseline Flora and Vegetation Survey in March 2023 (Trace, 2023) to establish baseline data consistent with the requirements of the Perdaman management plans and to confirm the findings of the APM (2019) survey. The Trace (2023) survey is provided with the revised Confirmed Flora Management Plan (PCF-PC-EN-FMP).

The survey included an assessment of vegetation condition, weeds and verification of locations of stockpiles for soil and vegetation. As these environmental factors have been identified as risks to threatened species and mitigated through management actions provided in Table 8-1, this supplementary baseline survey contributes to the status of environmental values prior to disturbance.

Key monitoring and reporting requirements prior to construction relate to the identification and avoidance of impacts to habitat, habitat features, threatened species and weed species. The Trace (2023) survey revisited and assessed the 34 retained monitoring sites residing outside of Project Ceres clearing boundaries. The weed species across Project Ceres clearing area were assessed by surveying weeds present 10 meters either side of the transect lines, where the transects line were approximately 100 meters apart. Where weed species were present, the density and size of the populations were recorded spatially. Where it was not possible to record individual weed points due to the population extent, the weed populations were recorded using polygons.

12.2 Environment Monitoring

Environmental monitoring shall be carried out in accordance with the requirements stated in Table 8-1. The monitoring program has been developed to mitigate impacts to threatened terrestrial fauna and migratory bird species and their habitat.

12.3 Environmental Inspections

Perdaman shall undertake weekly environmental inspections of all Project work areas and activities of theirProject Personnel.

These inspections will be specific to the work area and include relevant environmental aspects such as, butnot limited to:

- Hazardous materials storage and handling.
- Dust and other emissions management.
- Refueling activities.
- Land clearing and rehabilitation.
- Groundwater usage.
- Trench management.
- Noise management.
- Stormwater management including sediment basins and ponds.
- Spills, leaks and contaminated ground.
- Topsoil management.
- Waste management (liquid and solid); and
- Environmental incidents and corrective action close out.

12.4 Contingency Actions

Contingency Actions will be initiated where defined triggers and thresholds are exceeded, as provided in the Environmental Management Strategy for Listed Threatened and Migratory Species in Table 8-1.

The Contingency Actions provided in the Environmental Management Strategy for Listed Threatened and Migratory Species are considered a minimum standard and compliance is mandatory. An audit, inspection and monitoring regime conducted by Perdaman will monitor compliance with these requirements. Non-compliance with these Contingency Actions conditions could result in fines and penalties being levied against individuals and companies. Perdaman shall maintain a legal obligation register and implement systems to monitor and ensure compliance with these requirements.

12.5 Environmental Audits

Perdaman shall conduct annual environmental audits of individual construction work packages and operational areas via an integrated audit schedule. This will be undertaken to ensure all Project activities and environmental management processes conform with the planned arrangements and whether the PEMP and supporting sub-plans have been properly implemented. The key requirements to be reviewed may include:

- Performance against licensing and approvals conditions, project targets, objectives and policy statements.
- Adequacy of resources and training; and
- Complaints and non-conformance management.

The audit schedule will be developed in consultation with relevant internal stakeholders and Contractors. Results of all audits will be communicated and discussed at management review

meetings.

12.6 Environmental Reporting

In addition to Incident Reporting (Section 11.2) and Non-Conformance Reporting (Section 11.3), Perdaman is responsible for the preparation of overall Project related environmental reports including compiling data from monitoring programs.

Perdaman will compile monitoring data and relevant environmental information on a monthly basis.

Perdaman will report to the CEO, DCCEEW (and DBCA as required), on the implementation of this TSMP as part of compliancereporting and must be in strict accordance with Project Ceres's approval conditions.

Reporting to DBCA will occur for the following aspects:

- All threatened fauna injuries, unexpected deaths, unplanned euthanasia, and abandoned young or eggs. Reported in accordance with BC Act Section 40 Authorisation TFA 2223-0317 Condition 7 (no conditioned timeframe).
    - Reported to the DBCA Wildlife Protection Branch, Wildlife Licensing Section (wildlifelicensing@dbca.wa.gov.au) to notify of the incident and for advice on treatment or disposal. All deceased threatened fauna must be offered to the Western Australian Museum.
- Deviation from Management Plan that may directly or indirectly take or disturb threatened species. Reported in accordance with BC Act Section 40 Authorisation TFA 2223-0317 Condition 9, prior to the end of each annual period of the Authorisation (June).
    - Inform the CEO, via the Species and Communities Program (SpeciesandCommunities@dbca.wa.gov.au), in writing. Amendments are to be agreed in writing with the CEO, via the Species and Communities Program (SpeciesandCommunities@dbca.wa.gov.au).
- Taking and disturbance of threatened fauna. Reported in accordance with BC Act Section 40 Authorisation TFA 2223-0317 Condition 10, prior to the end of each annual period of the Authorisation (June).
    - Record the following details and provide this information to the Species and Communities Program (SpeciesandCommunities@dbca.wa.gov.au):
        - the location where the taking/disturbance occurred [recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA 1994), expressing the geographical coordinates in Eastings and Northings or decimal degrees].
        - the date that the taking/disturbance occurred.
        - activities undertaken.
        - the species/habitat and quantity taken (if known).
        - actions taken to avoid or minimise the risk of additional impacts to the species.
        - unintended incidents, injuries and mortalities of threatened fauna (if observed).
        - implemented monitoring; and
        - any other significant findings.
- Threatened fauna sightings (including known adverse events). Reported in accordance with BC Act Section 40 Authorisation TFA 2223-0317, Condition 11 (no conditioned timeframe). Report to fauna.data@dbca.wa.gov.au.
- Injured or deceased threatened, extinct or specially protected fauna under the Biodiversity Conservation Act 2016. Reported in accordance with BC Regulation 28 Fauna Taking (Relocation) Licence FR28000358, Condition 2 (no conditioned timeframe).
    - Contact the DBCA Wildlife Licensing Section (wildlifelicensing@dbca.wa.gov.au) for advice

on treatment or disposal. Details of such fauna must be included in the fauna taking return as required under the licence.

- Create, compile and maintain records and information as required by the licence of all fauna relocation activities as they occur. Reported in accordance with BC Regulation 28 Fauna Taking (Relocation) Licence FR28000358, Condition 5, prior to the expiry of the licence.
    - A DBCA approved “Return of Fauna Relocated” must be completed in full (including nil taking details) and submitted to DBCA Wildlife Licensing Section (wildlifelicensing@dbca.wa.gov.au).

Consistent with standard document control procedures, Perdaman will maintain copies of all reports submittedto DCCEEW, the CEO and DBCA.

A series of registers relevant to fauna management practices will be maintained throughout thelife of Project Ceres. These are listed below:

- Fauna Interaction Register – this includes: all fauna sightings records, including conservation significant fauna, feral and pest animals, records of injuries and mortality, location, species identification, fate of animal, etc. The register also creates notifications to relevant personnel to ensure reporting is consistent with regulatory approvals, and to the Perdaman Environment and Heritage Manager.
- Training records
- Environmental incident register - record and monitor all environmental incidents within Project Ceres.

The reporting and relevant compliance to be conducted for this TSMP is identified in Table 8-1, and reporting in accordance with the *EPBC Act 1999* Approval 2018/8383 and *EP Act 1986* Ministerial Approval MS 1180, are provided in the following sections.

12.7 EPBC Act Approval 2018/8383 Annual Compliance Report

The Annual Compliance Report (ACR) required under Condition 17 of the *EPBC Act 1999* Approval must be prepared by Perdaman for each 12-month period following the date of commencement of the action, or otherwise agreed in writing by the Minister. The action commenced on 11 July 2023 with the clearing of vegetation as part of the Main Roads WA Hearson Cove Road realignment works. Therefore, the ACRs are due 11 July each year.

The ACR should include:

- List of all conditions of the EPBC approval, including any variations to those conditions, noting if compliance or non-compliance with each condition has been achieved.
- Findings of non-compliance should be accompanied by a summary detailing any corrective measures taken
- The compliance report should discuss any new environmental risks that have become apparent during the reporting period.
- If a management plan is required under an approval condition:
    - the specifics in a management plan that support an approval condition should be detailed in the compliance report
    - material should be provided demonstrating that the requirements of that plan have been implemented.

12.8 Ministerial Statement 1180 Compliance Assessment Report

Perdaman is to submit to the CEO a Compliance Assessment Report (CAR) annually in accordance with Condition 15 of MS 1180. The CAR is to be prepared in accordance with the Confirmed Compliance Assessment Plan (PCF-PD-EN-CAP).

The first CAR is to be submitted fifteen months from the date of issue of MS 1180. The Statement was

issued on 24 January 2022. Therefore, the first CAR was due 24 June 2023. CAR's are required annually from the date of submission of the first CAR, therefore, by 24 June, each year.

The CAR demonstrates Perdaman's compliance with MS 1180 through reporting the monitoring results in comparison to the established trigger and threshold criteria in each Confirmed management plan. This will help to identify non-compliances and describe the corrective and preventative actions to be taken to maintain compliance.

In accordance with Condition 15-7 of MS 1180, each CAR shall:

1. be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf.
2. include a statement as to whether the proponent has complied with the Conditions.
3. identify all potential non-compliances and describe corrective and preventative actions taken.
4. be made publicly available in accordance with the approved Compliance Assessment Plan; and
5. indicate any proposed changes to the Compliance Assessment Plan required by Condition 15-2.

Where the outcome of objective is not met and the trigger / threshold criteria are exceeded during the reporting period, the CAR shall include a description of revised management actions / contingency actions to be implemented to achieve the outcome and objectives during the next reporting period. All changes to management actions will require review and approval by the CEO.

12.9 Ministerial Statement 1180 Environmental Performance Report

Perdaman is to submit an Environmental Performance Report (EPR) to the Western Australian Minister for Environment and MAC every five years in accordance with Condition 12 of MS 1180.

The first report is to be submitted within three months of the expiry of the five-year period commencing from the first date of Ground Disturbing Activities or another time approved by the CEO. Ground Disturbing Activities commenced on 11 July 2023 by Main Roads WA for the development of Hearson Cove Road. Therefore, the first report is due no later than 11 October 2028.

Relative to threatened terrestrial fauna and migratory bird species, the EPR shall report on the following:

- State of fauna habitat (Rocky Outcrops, Hummock Grasslands, Samphire Shrublands and Drainage Lines)
- Feral animal sightings
- Threatened terrestrial fauna and migratory bird species deaths and injuries / incidents
- Any interaction with threatened terrestrial fauna and migratory bird species

The report shall include a comparison of those values mentioned above at the end of the five-year period against the state of each value at the beginning of the five-year period. Also, a comparison of the environmental values identified above at the end of the five-year period; against the state of the environmental values identified in first EPR submitted in accordance with Condition 12-2. In addition, the report will include the proposed Adaptive Management and continuous improvement strategies.

13 Threatened Species Management Plan Review

Ongoing monitoring of this TSMP and its commitments will ensure environmental risks associated with threatened species are identified, monitored and addressed in a timely manner. This includes monitoring the key characteristics of all Project activities that may have significant environmental impacts, such as operational controls, conformance with objectives and periodic evaluation of compliance with legislation and regulations.

Findings of monitoring and measurement processes will be reviewed periodically and reported through monthlyreports and a management review twice a year. The monthly reports will provide information to satisfy approval conditions while the management review will be a self-evaluation audit of conformity to Perdaman's corporateenvironmental management system requirements.

Regular environmental inspections conducted by Perdaman's Environmental Representatives will provide assurance that all personnel and operating processes are continually addressing environmental issues through a process of continual improvement.

Additional monitoring may be required to understand potential exceedances or non-conformances, such as, but not limited to, excessive noise levels at sensitive receivers, weed establishment on site and discharge water quality.

This TSMP will be reviewed and updated upon meeting the following conditions:

- At least annually throughout the life of Project Ceres.
- As a result of significant incidents that have directly impacted threatened terrestrial fauna and migratory bird species.
- When performance improvements are identified for the protection of threatened terrestrial fauna and migratory bird species.
- When changes to operational processes pose a risk to threatened terrestrial fauna and migratory bird species.
- Outcomes of monitoring programs are received
- Implementation and effectiveness of management measures and monitoring programs.
- Threshold/trigger criteria and threshold/trigger level actions.
- Changes to relevant legislation, policy, guidelines, management plans and industry practices.
- Changes to the conservation status of fauna species.
- The identification of a conservation significant fauna species, threatened terrestrial fauna species or migratory bird species not previously confirmed within Project Ceres area.
- Specialist advice.
- Stakeholder consultation.
- Review will also include a gap analysis of current early response actions, trigger response actions and threshold contingency actions to identify non-compliances and where necessary any additional actions that may be required to minimise risk of further exceedance.

Any revisions or amendments of this TSMP must be in consultation with MAC and must be submitted to the CEO and DCCEEW as per Condition 5-8 of MS 1180.

This plan has been amended from the previous version PCF-PD-EN-TSMP_PCF5 to ensure that all commitments and conditions required in accordance with regulatory approvals are captured and addressed.

All changes to this Threatened Species Management Plan post-assessment must be provided separate to compliance reports and submitted to registrar@dwer.wa.gov.au, the DCCEEW and DBCA.

14 Changes to the TSMP

Table 14-1 Changes to TSMP

Complexity of changes:	**Minor Revisions** ☐	**Moderate Revisions** ☐	**Major Revisions** ☒	
Number of Key Environmental Factors:	**One** ☒	**2-3** ☒	**> 3** ☐	
Date revision submitted to EPA: EPA, DCCEEW and DBCA: 01/02/2022				
Proponent's operational requirement timeframe for approval of revision. **Reason for Timeframe:** Approval of revision not required	**< One Month** ☒	**< Six Months** ☐	**> Six Months** ☐	**None** ☒

Item No.	EMP Section No.	EMP Page No.	Summary of change	Reason for change
1	ES	Iv	Construction & Operations Commencement Dates	Update consistent with current construction schedule
2	ES	iv	Purpose of the TSMP	Update to include *Biodiversity Conservation Act 2016* (BC Act) Approval TFA 2223-3017
3	ES	iv	Key environmental factors and objectives	Update to reflect environmental outcomes, EPA factors and environmental objective of MS 1180 and EPBC Approval
4	ES	iv	Condition clauses	Update to include reference to approvals.
5	1	1	Context, Scope & Rationale	Update from "Introduction" to detail Project Description, Scope & Requirements, Responsibility, and Key Environmental Factors. Scope revised to address requirements of MS 1180 and EPBC Act. Key Environmental Factors updated to reflect EPA assessment of risks and residual impacts, and management through conditions of MS 1180 management plans.
6	2	9	Legislative Framework	Updated to reflect current environmental approvals. "Ground Disturbance Permits" moved to Section 9.3 "Matters relating to the EPBC Act – Listed Threatened and Migratory Species" moved to Section 4. Updated to reflect amendment to S40 and GHD (2023) assessment.
7	3	16	Roles and Responsibilities	Updated to reflect current roles and responsibilities.
8	4	19	Rationale & Approach	Includes previous section headed "Study and Survey Findings". Section updated to summarise Marine Fauna Desktop Assessment (Pendoley, 2019), and Pre-and Post-Wet Season Biological Survey (APM, 2019).
9	4.1.1	20	Technical Memorandum – Assessment of Proposed Changes to Management Actions	Addition of information from GHD (2023) risk assessment.
10	4.2	21	Terrestrial Vertebrate Fauna	Updated previous section headed "Terrestrial Fauna". Updated to include summary of desktop and field studies. Discussion on Fauna Habitats moved to Section 5. Updated to include list of threatened terrestrial fauna species identified within 25km buffer through Threatened Fauna Database (DBCA) search and APM, 2019 studies.

				Refers to studies provided in Attachments A and B.
11	4.3	25	Avifauna/Migratory Birds	Previously section 5.3. Updated to include summary of desktop and field studies. Removed table listing “bird species identified within a 10km buffer”. Refers to studies provided in Attachments A and B.
12	4.4	26	Marine Fauna	Updated to include summary of EPA Assessment to confirm impacts to marine water quality and marine fauna assessed to be insignificant. Updated table to list threatened marine fauna species identified through desktop assessment, removed table listing “threatened aquatic fauna species identified within 10km buffer”. Refers to studies provided in Attachments A and B.
13	5	29	Fauna Habitat	Added introduction to section. Added Figure 5-1 Fauna Habitat Removed Section 6.5 Rocky Outcrops and Dunes (repeat of Section 5.1).
14	6	33	Potentially Impacted Species	New section discussing the Listed threatened species and communities (sections 18 and 18A) EPBC Act 1999, Listed migratory species (sections 20 and 20A) EPBC Act, and Conservation Significant Vertebrate Terrestrial Fauna (BC Act).
15	6.1.1 – 6.1.4	34	Ghost Bat, Northern Quoll, Pilbara Olive Python, Night Parrot	Updated to include information from GHD (2023) risk assessment.
16	6.2.1	37	Migratory Birds	Updated to include information from GHD (2023) risk assessment.
17	6.3.1 – 6.3.3	39	Northern coastal free-tailed bat, Bilby, Pilbara leaf-nosed bat (Pilbara Form)	Updated to include information from GHD (2023) risk assessment.
18	7.1	41	Reduction and/or Fragmentation of Terrestrial Fauna Habitat	Updated to reference “terrestrial”. Added additional information. Table 7-1 updated to remove “Likelihood of Occurrence”, discussed in Section 6. Updated to Potential “Threatened” Species. Areas of specific footprints to be cleared removed. “Total (ha)” updated to reflect current design of Project Ceres.
19	7.2	42	Vehicle Strike	Updated to include vessel strike on marine fauna.
20	7.4	42	Light Pollution	Updated to include information from GHD (2023) risk assessment.
21	7.5	42	Noise and Vibration	Update to include reference to Construction Environmental Management Plan Noise Management Protocol 0000-ZA-E-09071.
22	7.7	43	Marine Environmental Quality	Includes previous sections “Changes to water quality at MUBRL outfall” and “Water quality”.
23	7.8	43	Inland Water Flows and Water Quality	Added as per EPA Assessment Report.
24	7.9	44	Waste Management	Added as this is considered a risk to threatened species.
25	7.10	44	Fire	Added as per EPA Assessment Report.
26	7.11	44	Dust	Added as per EPA Assessment Report.
27	7.12	44	Risk Assessment of Impacts to Threatened Species	Table 7-2 updated to reflect actual risks to species as identified through biological surveys and EPA Assessment Report.

				Inclusion of EPA Assessment Report findings. Migratory Marine Fauna (including turtles) updated to reflect EPA Assessment findings and removal of requirement to prepare Turtle Management Plan, consistent with Assessment. Updated to include information from GHD (2023) risk assessment.
28	8	50	Mitigation and Management Actions	Combines previous Section 7.10 Environmental Management Strategy for Threatened and Migratory Species and Attachment C "Environmental Management Strategy", and text from previous Section 7.9 Risk Assessment. Added Table 8-1 "Environmental Management Strategy for Listed Threatened and Migratory Species". Table 8-1 includes information from previous Attachment C. Updated to summarise identified impacts to specific threatened species. Note: Management Actions are unchanged. Monitoring and Reporting updated to reflect current management strategies and reporting under current environmental approvals. Timing updated to reflect current management strategies. Supporting Documents updated to reflect current documentation. Trigger and Threshold Criterion refined to be clearer in intent. No change has been made to the actual triggers or thresholds. Threshold Contingency Actions updated to reflect current regulatory requirements.
29	8.1	159	Additional mitigation strategies for Implementation for Night Works During Construction and Commissioning	Added to include mitigation strategies recommended by GHD (2023) risk assessment.
30	9.1	162	Project Inductions	Added Night Works Induction requirement.
31	9.3	163	Ground Disturbance Permits	Moved from previous Section 2.
32	Prev Section 10		Stakeholder Consultation	Table 10-1 moved to App 2 and section 10 reviewed.
33	11.2	167	Incident Reporting and Investigation	Updated to reflect information provided in Table 8-1, and requirements of BC Act authorisation.
34	11.3	167	Non-Conformance Management	Updated to include reporting to DBCA where threatened fauna injuries, unexpected deaths, unplanned euthanasia, and abandoned young or eggs occur.
35	12	170	Environmental Monitoring and Reporting	Reference made to monitoring listed in Table 8-1.
36	12.1	170	Pre-clearance Survey	Updated to reflect additional survey carried out by Trace Archaeology and Ecology (2023).
37	12.2	171	Environmental Monitoring	Removed "Environmental Monitoring Program", as all monitoring is provided in Table 8-1.
38	12.4	171	Contingency Actions	Changed reference from "Attachment C" to Table 8-1.
39	12.6	172	Environmental Reporting	Updated to reflect reporting requirements of environmental approvals and licence.
40	12.7	173	EPBC Act Approval 2018/8383 Annual Compliance Report	Added

41	12.8	173	Ministerial Statement 1180 Compliance Assessment Report	Added
42	12.9	174	Ministerial Statement 1180 Environmental Performance Report	Added
43	13	175	Threatened Species Management Plan Review	Updated from “Review and Continual Improvement”. Added Table 13-1 (this table).
44	14	176	Changes to TSMP Table	Moved from section 13 to newly created section 14. Table 13-1 re-numbered to 14.1.
45	App. 1		Environmental Approval Conditions (Terrestrial Fauna)	Added
46	Att. A		Marine Fauna Desktop Assessment	Previously referred to Environmental Review Document, now included in TSMP.
47	Att. B		Pre- and Post-Wet Season Biological Survey	Previously referred to Environmental Review Document, now included in TSMP.
48	Att C		GHD Technical Memorandum, December 2023	Added
49	Prev Att C			Attachment C removed, included in Table 8-1.
50	Prev Att. D		Fauna Interaction Register	Removed. This is now an online, GIS-enabled system specifically designed for Project Ceres.
51	Att.D/E/F/G		MAC Consultations	Added new Attachments D, E, F, and G

15 Definitions

Contractor

The Contractor on Project Ceres is any individual or party engaged directly or indirectly by Perdaman, that is notan employee of Perdaman, to carry out Project Ceres.

Environmental Representative

The Environmental Representative includes Perdaman's Environment and Heritage Manager, the Environmental Coordinator or their delegated representative.

May

Indicates that the Subcontractor is permitted to do something, or the Contractor reserves the right to dosomething according to the text.

Perdaman

Perdaman Chemicals and Fertilisers Pty Ltd is the proponent of Project Ceres.

Project Personnel

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

Project Work Sites

Project Ceres work sites include Area C, Area F, the causeway linking these two areas, the conveyor corridor tothe Port and the Port storage and loading infrastructure. It can also include any other Project relevant locationunder operational control of Perdaman.

Should

Indicates a recommendation.

Will

Indicates that a statement is mandatory.

Works

Works includes all work which Perdaman and or its Contractors are required to perform to comply with itsobligations under their relevant scope of works pertaining to Project Ceres.

16 Abbreviations

Abbreviation	Description
AHD	Australian Height Datum
APM	Animal Plant Mineral Pty Ltd.
BSIA	Burrup Strategic Industrial Area
CAR	Compliance Assessment Report
CEO	CEO of the Environmental Protection Authority
CWEC	Critical Weather Event Committee
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, the Environment, Energy and Water
DOEE	Department of Environment and Energy
EIRP	Emergency Incident Response Plan
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act
ERMP	Emergency Response Management Plan
EWSC	East West Service Corridor
GDP	Ground Disturbance Permit
ICAM	Incident Cause Analysis Method
LNG	Liquified Natural Gas
MAC	Murujuga Aboriginal Corporation
MNES	Matters of National Environmental Significance
Mtpa	Million tonnes per annum
OEMP	Operational Environmental Management Plan (PPA specific)
PEMP	Project Environmental Management Plan
PPA	Pilbara Ports Authority
PPE	Personal protective equipment

17 References

- PCF-PD-PN-PEMP (2021) Perdaman Project Destiny Environmental Management Plan.
- APM (2019) Perdaman Urea Project – Pre and Post-wet Season Biological Survey.
- Pendoley (2019) Marine Fauna Desktop Assessment.
- Environment Protection Authority (2018) Statement of Environmental Principles, Factors and Objectives.
- EPA (2018) Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual.
- EPA (2016) Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures2016.
- EPA (2016) Environmental Factor Guideline: Terrestrial Fauna.
- EPA (2016) Technical Guidance: Terrestrial Fauna Survey.
- EPA (2016) Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna.
- EPA (2016) Technical Guidance: Sampling of Short-range Endemic Invertebrate Fauna.
- Commonwealth of Australia (1996) The National Strategy for the Conservation of Australia's Biological Diversity.
- Commonwealth of Australia (2001) National Objectives and Targets for Biodiversity Conservation 2001-2005.
- Commonwealth of Australia (2015) Wildlife Conservation Plan for Migratory Shorebirds. Canberra, ACT: Department of the Environment. Available from: http://www.environmert.qov.au/biodiversity/publications/wildlife-conservation-plan-miqratoryshorebirds- 2016
- Department of Environment (2006) Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives – Marine Report Series, Report No.1, Available from: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/pilbaracoastalwaterquality_Marine%20Report%201.pdf.
- Department of the Environment (2015) Conservation Advice *Calidris ferruginea* curlew sandpiper. Canberra: Department of the Environment. Available from: http://www.environment.qov.au/biodiversity/threatened/species/pubs/856-conservationadvice.pdf.
- Department of the Environment (2015). Conservation Advice *Numenius madagascariensis* eastern curlew. Canberra: Department of the Environment. Available from: http//:www.environment.gov.au/biodversity/threatened/species/pubs/847conservation-advice.pdf.
- Department of the Environment (2015). Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environmentAov.au/biodiversity/threatened/publications/tap/threat-abatement-planferal-cats.
- Department of the Environment (2015) Wildlife Conservation Plan for Migratory Shorebirds.
- Department of the Environment and Energy (2014) Environmental Management Plan Guidelines, Commonwealth of Australia.
- DoEE (2017) Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species
- DoEE (2017) Threat abatement plan for predation, habitat degradation, competition and disease

transmission by feral pigs.

- DOEE (2019) Protected Matters Search Tool.
- DoEE (2020) Light Pollution Guidelines: National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds.
- Department of the Environment, Water, Heritage and the Arts (2008). Approved Conservation Advice for *Liasis olivaceus barroni* (Olive Python - Pilbara subspecies). Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.qov.au/biodiversity/threatened/species/pubsj66699-conservation-advice.pdf.
- DEWHA (2008). Threat abatement plan for predation by the European red fox. DEWHA, Canberra. Available from:http://www.environment.qov.au/biodiversity/threatened/publications/tap/predation-european-red- fox.
- DEWHA (2009) Significant impact guidelines for 36 migratory shorebirds species (EPBC Act Policy Statement 3.21).
- DEWHA (2010) Survey Guidelines for Australia's Threatened Bats.
- DEWHA (2010) Survey Guidelines for Australia's Threatened Birds.
- DEWHA (2011) Survey Guidelines for Australia's Threatened Reptiles.
- Department of Sustainability, Environment, Water, Population and Communities (2011) Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/resource/threat-abatement-plan-biolcqical-effects-includinq-lethal- toxic ingestion-caused-cane-toads.
- DSEWPaC (2012) Marine bioregional plan for the North-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional-plans/north-west.
- GHD (2023) Technical Memorandum: Perdaman Project Ceres – Biodiversity Conservation Act S40 Approval, Conditions of Approval Amendment Risk Assessment. Prepared for Clough Group, December 2023.
- Government of Western Australia (2014) Environmental Offsets Guidelines.
- Government of Western Australia (2011) Environmental Offsets Policy.
- Higgins and Davies (1996) Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons.
- Hill, B.M. & S.J. Ward (2010). National Recovery Plan for the Northern Quoll *Dasyurus hallucatus*. Department of Natural Resources, Environment, The Arts and Sport, Darwin. Available from: http://www.environment.gcv.au/resource/nationalrecovery-plan-northern-quoll-dasyurus-hallucatus.
- R.E. Johnstone, Allan H. Burbidge and J.C. Darnell (2013) Birds of the Pilbara region, including seas and offshore islands, Western Australia: distribution, status and historical changes. Records of the Western Australian Museum, Supplement 78: 343–441.
- Threatened Species Scientific Committee (2005). Commonwealth Listing Advice on Northern Quoll (*Dasyurus hallucatus*). Available from: http://www.environment.gov.au/biodiversity/threatened/species/dasyurus-hallucatus.html.
- Threatened Species Scientific Committee (2016) Conservation Advice *Calidris cantus* Red knot. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservationadvice-05052016.pdf.

- Threatened Species Scientific Committee (2016) Conservation Advice *Macroderma gigas* ghost bat. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/174conservation-advice-05052016. pdf.
- Threatened Species Scientific Committee (2016). Conservation Advice *Celidris tenuirostriss* Great knot. Canberra: Department of the Environment. Available from: httpWwww.environment.gov.au/biodversity/threatened/species/pubs/862conservation-advice-05052016.pdf.
- Trace Archaeology & Ecology (2023) Final Report: Supplementary Baseline Flora and Vegetation Survey. Prepared for Saipem Clough Joint Venture.

References from GHD (2023) Technical Memorandum:

- Armstrong KN & Anstee SD (2000) The ghost bat in the Pilbara: 100 years on. Australian Mammalogy 22, 93-101. Australian Museum. Greater Bilby Profile. Date accessed 23 November 2023. Available online at: Greater Bilby - The Australian Museum.
- Bat Call WA 2021, A review of ghost bat ecology, threats and survey requirements, report prepared for the Department of Agriculture, Water and the Environment, Canberra. CC BY-NC-ND 4.0.
- Biologic Environmental Survey (2019) Western Range Ghost Bat Scat Analysis Report. Report Prepared for Rio Tinto.
- Birdlife International (2023) Night Parrot factsheet. Date accessed 22/11/2023. Available online at: Night Parrot (Pezoporus occidentalis) - BirdLife species factsheet.
- Cowan, M. (2023) Ghost bat: the phantom of the Australian night sky (cosmosmagazine.com) Date accessed: 29 November 2023.
- Cramer, V., K.N. Armstrong, R. Bullen, R. Ellis, L. Gibson, N. McKenzie, M. O'Connell, A. Spate & S. van Leeuwen (2016). Research priorities for the Pilbara leaf-nosed bat (Rhinonicteris aurantia Pilbara form). Australian Mammalogy. http://dx.doi.org/10.1071/AM15012. Available from: http://www.publish.csiro.au/paper/AM15012.htm.
- Cramer, VA, Armstrong, KN, Bullen, RD, Cross, SL, Gibson, L, Hanrahan, N, Knuckey, CG, Ottewell, K, Reiffer, S, Ruykys, L, Shaw, RE, Thavornkanlapachai, R, Thompson, SA, Wild, S & Van Leeuwen, S 2022, 'Research priorities for the ghost bat (Macroderma gigas) in the Pilbara region of Western Australia', Australian Mammalogy. https://doi.org/10.1071/AM21042.
- Department of Climate Change, Energy, the Environment and Water (2023), Australian Government, accessed 22 November 2023, Threatened Species Strategy 2015- 2020. https://www.dcceew.gov.au/environment/biodiversity/threatened/action-plan/priority-birds/night-parrot Department of Climate Change, Energy, the Environment and Water (2016), Species Profile and Threats Database, Australian Government, accessed 22 November 2023, Pezoporus occidentalis — Night Parrot (environment.gov.au)
- Department of Climate Change, Energy, the Environment and Water (2016), Australian Government. Threatened Species Scientific Committee. Greater Bilby – Conservation Advice. Available online at: 282 - Conservation Advice - 150716 (environment.gov.au).
- Department of Climate Change, Energy, the Environment and Water (2016), Species Profile and Threats Database, Australian Government, accessed 22 November 2023, Rhinonicteris aurantia (Pilbara form) — Pilbara Leaf-nosed Bat (environment.gov.au).
- Department of Climate Change, Energy, the Environment and Water (2016), Australian Government. EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species.
- Department of Climate Change, Energy, the Environment and Water 2023, Australian Government, Australian Government. Northern Quoll. Accessed 21 November 2023. Available

online at; Northern Quoll (Dasyurus hallucatus) - DCCEEW.

- Gaston, K.J., Davies, T.W., Bennie, J. and Hopkins, J. (2012), REVIEW: Reducing the ecological consequences of night-time light pollution: options and developments. J Appl Ecol, 49: 1256-1266. https://doi.org/10.1111/j.1365-2664.2012.02212.
- Henderson, M. (2015). The Effects of Mining Infrastructure on Northern quoll Movement and Habitat. Honours Thesis. Edith Cowan University.
- Ladyman, M. (2019) Animal Plant Mineral (APM). Perdaman Urea Project; Pre and Post wet season Biological Survey, Burrup Peninsula, WA.
- Leseberg, Nicholas P., McAllan, Ian A. W., Murphy, Stephen A., Burbidge, Allan H., Joseph Leo, Parker Shane A., Jackett Nigel A., Fuller, Richard A. & Watson, James E. M. (2021) Using anecdotal reports to clarify the distribution and status of a near mythical species: Australia's Night Parrot (Pezoporus occidentalis), Emu - Austral Ornithology, 121:3, 239-249, DOI: 10.1080/01584197.2021.1927760
- Longcore, T. and Rich, C. (2004), Ecological light pollution. Frontiers in Ecology and the Environment, 2: 191-198. https://doi.org/10.1890/1540-9295(2004)002[0191:ELP]2.0.CO;2.
- Morcombe, M. (2020) Birds of Australia, Digital Edition, Version 1.5. PDA Solutions 2003-2013. Northover, A., Dziminski, M., Moore, H., Palmer, R., Ottewell, K., Carpenter, F., and Gibson, L., 2023. The Pilbara Bilby (Macrotis lagotis) Research Program: a review of progress (2013-2023). Department of Biodiversity, Conservation and Attractions, Perth.
- Pearson, D. (2003). Giant Pythons of the Pilbara. Landscope. 19(1).
- Pizzey, G and Knight, F (2020) Birds of Australia, Digital Edition, Version 1.3. Gibbon Mutimedia (Aus) Pty Ltd 2013-2020.
- Rohweder, D. A., and Lewis, B. D. (2001). Day–night habitat use by double-banded plovers Charadrius bicinctus in the Richmond River Estuary, northern New South Wales. Corella 26, 33–37.
- Stone, E., Jones, G. & Harris, S. (2009) Street Lighting Disturbs Commuting Bats. Current Biology, Vol. 19, Issue 13, Pg. 1123-1127.
- Szabo Judit K., Battley Phil F., Buchanan Katherine L., Rogers Danny I. (2016) What does the future hold for shorebirds in the East Asian–Australasian Flyway? Emu 116, 95-99.
- Tutt, M., S. Fekete, S. Mitchell, P. Brace & D. Pearson (2004). Unravelling the mysteries of Pilbara Olive Python ecology. Threatened Species Network Community Grants Final Report-Project WA11/101. Karratha: Nickol Bay Naturalists' Club/WA CaLM.
- Tutt,M. S. Mitchell, P. Brace & D. Pearson (2002). Conserving Pilbara olive pythons on the Burrup. Threatened Species Network community grants annual report, Project WA04/100. Karratha: Nickol Bay Naturalists' Club/WA CaLM.
- Van Dyck, S., Gynther, I., and Baker, A. (2013). Field Companion to the Mammals of Australia. New Holland Publishers, Sydney.
- Wilson D.E. & Mittermeier R.A. (eds.) 2019: Handbook of the Mammals of the World - Vol. 9, Bats. Lynx Editions, Barcelona: 1008 pp., 74 colour plates, more than 450 colour photos, 1423 distribution maps. ISBN: 978-84-16728-19-0.
- Wilson, S. & Swan, G. (2017) A Complete Guide to Reptiles of Australia. Fifth Edition, Reed New Holland Publishers. Sydney.
- Worley Astron (2006) Pluto LNG Development Desktop Fauna Report. Prepared for Sinclair Knight Merz. Wright, M, D., Goodman, P. & Cameron, T, C. (2010) Exploring behavioural responses of shorebirds to impulsive noise. Wildfowl, [S.l.], p. 150-167, apr. 2013. ISSN 2052-6458. Available online at: https://wildfowl.wwt.org.uk/index.php/wildfowl/article/view/1230.

18 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**	☐	

Appendix 1 - Environmental Approval Conditions (Terrestrial Fauna)

Appendix 2 - Stakeholder Consultation Register

Date	Stakeholder	Consultation Type	Issues, Topic Raised	Perdaman Response
8 January 2024	Murujuga Aboriginal Corporation (MAC) and Circle of Elders	MS 1180 EPA Plans annual review and consult session	• Flora Management Plan • Fauna Management Plan • Threatened Species Management Plan • Light Management Plan • Cultural Heritage Management Plan • Surface Water Management Plan	None required.
August 2023	Murujuga Aboriginal Corporation (MAC) and Circle of Elders	MS 1180 EPA Plans review and consult session	• Flora Management Plan • Fauna Management Plan • Threatened Species Management Plan • Light Management Plan	None required.
April 2022 (various follow up meetings during this period).	Murujuga Aboriginal Corporation (MAC) and Circle of Elders	Site visit / Presentation / Endorsement of salvage and relocation methodology	Presentation on the proposed salvage and relocation methodology for sites ID18615, ID19239 and ID19874, and the process for detailed salvage assessments. Addition of Cultural Significance and Cultural Risk sections to the detailed salvage assessments. Endorsement of the detailed salvage assessments and methodology for salvage and relocation by MAC and the Circle of Elders.	MAC endorsed and approved proposed relocation strategy of sites to Reserve 43195. MAC request that Perdaman engage the services of a Marban man to oversee relocation of site ID18615 to ensure cultural safety of those involved in the relocation process. Perdaman to engage MAC to monitor all salvage and relocation activities.
30 Mar 2022	Murujuga Aboriginal Corporation (MAC) and Circle of Elders	Presentation / Meeting	Presentations on design modifications applied to avoid Cultural Heritage Sites in the PDE.	Commitment by Perdaman to engage in further meetings held on country to gain a further understanding of sites endorsed for salvage and relocation.
31 Jan 2022	Murujuga Aboriginal Corporation (MAC) and Circle of Elders	Presentation / Meeting / Endorsement of CHMP	Presentation of the salvage and relocation proposal for the CHMP (Cultural Heritage Management Plan).	Endorsement of the amended CHMP and of the salvage and relocation methodology.

Date	Stakeholder	Consultation Type	Issues, Topic Raised	Perdaman Response
24 Jan 2022	Murujuga Aboriginal Corporation (MAC)	Site visit/ Presentation	MAC Board Presentation of key aspects of this amended Surface Water Management Plan for discussion. Opportunities Potential challenges and solutions.	None Required.
2019 & 2020 (Various times during this period)	Hon. Alannah MacTiernan	Presentation / Meeting	Project update including: - Community stakeholder consultation & feedback - Environmental Impact Assessment - Common-user infrastructure - Social benefits - Employment opportunities - Training opportunities	Details discussed including potential social and economic benefits Commercial arrangements with Pilbara Ports Authority and the Water Corporation
January 2020	MAC	In principle Endorsement of Heritage Charter	Perdaman Urea Project Overarching Position for Heritage Interaction and management, including Rock Art and Murujuga.	In principle (subject to final Part IV approval of Project) endorsement of Proponent commitment to its overarching position which will underpin Aboriginal Heritage Management Plans, protocols and actions for life of Project Ceres
November & December 2019	Hon. Mark McGowen, Premier	Presentation / Meeting	Project update including - Community stakeholder consultation & feedback - Social benefits - Employment opportunities - Training opportunities - Environmental Impact Assessment - Common-user Infrastructure	Details discussed including potential social and economic benefits Commercial arrangements with the Pilbara Ports Authority and the Water Corporation
November 2019	Hon. Ben Morton, Assistant Minister to the Prime Minister and Cabinet	Presentation / Meeting	Project update including - Community stakeholder consultation & feedback - Social benefits - Employment opportunities - Training opportunities - Environmental Impact Assessment - Common-user Infrastructure	Details discussed including potential social and economic benefits Commercial arrangements with State GTEs and common-user infrastructure requirements
27 November 2019	MAC	Agreement Signing	Signing of Commercial Agreement, transformative opportunities	Agreement on mutual support for future aspirations of both parties
14 October 2019	Kevin Michel MLA, Karratha	Briefing	Update on the Environmental Impact Assessment Update on liaison with other community stakeholders	Details discussed

Date	Stakeholder	Consultation Type	Issues, Topic Raised	Perdaman Response
14 October 2019	City of Karratha, PDC	Meeting	Update on the Environmental Impact Assessment Discussions about the housing strategy, City of Karratha is supportive of a strategy that will provide long-term benefits to the community	Details discussed Accommodations for Project Ceres will be integrated to the local community rather than building isolated camps
14 October 2019	Circle of Elders	Presentation / Meeting	Access to the meeting site in the south-west corner to Site F Location of the proposed infrastructure on site Transformative opportunities	The fence that will be installed aims at preventing site workers to access the cultural site and will not block access for the Traditional Owners (TO) Refer to Figures in Appendix A of the ERD Commercial Agreement to be signed with MAC
14 October 2019	MAC	Workshop	Commercial Agreement, transformative opportunities	Further discussions to be held between MAC and the Proponent
September 2019	Hon. Ben Wyatt, Treasure	Presentation / Meeting	Update on Project including the Environmental Impact Assessment	Details discussed including potential social and economic benefits
20 September 2019	MAC & Advisors	Meeting	Commercial Agreement, transformative opportunities	Further discussions to be held between MAC and the Proponent
4 September 2019	MAC & Advisors	Meeting	Commercial Agreement, transformative opportunities	Further discussions to be held between MAC and the Proponent
June-August 2019	Pilbara Ports Authority (PPS)	Online form, letter	Panamax size vessels Capacity of the shed at the Port	The Proponent will be using high tides to access the berth Storage capacity at the port changed to 65,000 tonnes
05 July 2019	MAC	Presentation / Meeting	Assessment timeline clarification Plant design	The Proponent provided clarification regarding the environmental approval processes The Proponent provided an update on the plant design MAC advised that they support the draft ESD and confirmed Project Ceres aligns with their core objectives (ref. email to the EPA of the 8th July 2019).
June 2019	Karratha, Roebourne, Dampier and Wickham	Information booths, online form	Project timeline Employment opportunities	Refer to Section 2.3.7 of the ERD.

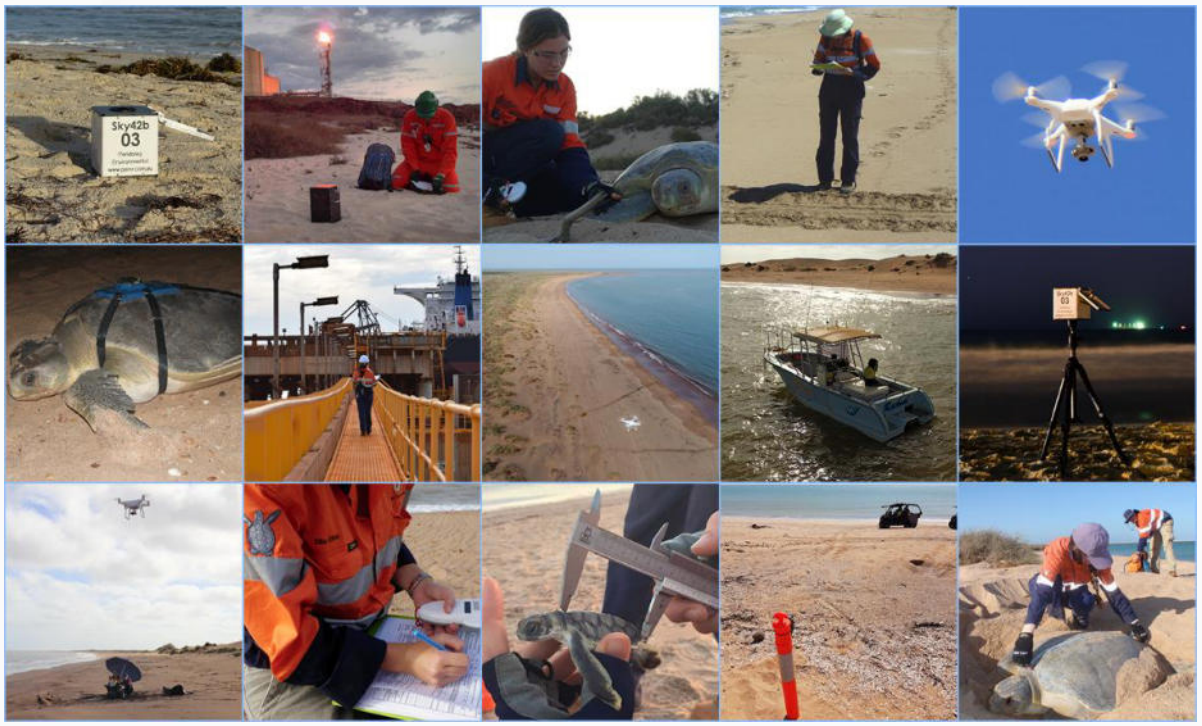
Date	Stakeholder	Consultation Type	Issues, Topic Raised	Perdaman Response
	Community			
16 May 2019	Pilbara Development Corporation (PDC)	Meeting	PDC indicated a preference for flexible working hours for employees so they can pursue activities/sports Visual amenity	The Proponent is committing to give the opportunity to all employees to request flexibility to pursue nominated activities / hobbies / sports. Refer to Section 4.9.5 (ERD)
16 May 2019	NYFL	Presentation / workshop	Approach to monitoring and detriment to rock art NYFL Chairman requested information about continuous access for Aboriginal people to NHL area thought to be associated with “Fish Thalu” site within the boundary of site F. Any changes to access into Ngajarli as a result of Hearson Cove Road realignment. Access to the meeting site in the south-west corner of site F. Visual aspects and opportunities.	The Proponent worked with Woodside to obtain a comprehensive regional airshed model (Section 4.8.5 and Appendix D (ERD)). An Air Quality Management Plan and Heritage Management Plan have been developed (Appendix K (ERD)). The Proponent will make access arrangements whereby those with connection to the NHL site would be met at the gate and escorted to the sacred site. The sacred “Fish Thalu” site is outside the operational site boundary (refer to plan layout, Figure 3, Appendix A of the ERD). Hearson Cove Road will be realigned to its official gazetted alignment. Access to Ngajarli will be maintained. The construction-phase boundary has been modified to ensure this cultural site is outside of the fenced area and its use is not impaired. Discussed opportunities to use the wall surfaces of Project buildings and facilities as a medium for Aboriginal artworks and as a visual medium to communicate heritage stories.
April 2019	Woodside	Meeting	Air Quality modelling	Data share agreement
February 2019	Senator Michaelia Cash, Federal Minister for Employment, Skills, Small and Family	Meeting	Update on Project including –Potential social benefits –Potential employment & training opportunities –Potential economic opportunities	Details discussed
25 February	Water	Letter	Discharge in the MUBRL and	Appendix J of the ERD

Date	Stakeholder	Consultation Type	Issues, Topic Raised	Perdaman Response
2019	Corporation		seawater intake	
12 February 2019	Murujuga Aboriginal Corporation (MAC) City of Karratha	Site visit / Presentation	MAC: Construction phase, Site preparation, Plant erection Potential Heritage issues Plant emissions / impacts on Burrup Rock Art General processing plant understanding Employment, training and business opportunities MAC could benefit from Work undertaken to evaluate a Project location at Maitland City of Karratha: The City of Karratha would prefer that the Dampier public wharf be used, and the shed located north of proposed options A & B.	Section 2.3.3 of the ERD Section 2.2.4 of the ERD Third option 'C' added to the Port infrastructure location options. Refer to Section 2.2.6 of the ERD

Attachment A - Marine Fauna Desktop Assessment

CARDNO, INC.

PERDAMAN UREA PROJECT: MARINE FAUNA DESKTOP ASSESSMENT



Prepared by

Pendoley Environmental Pty Ltd

For

Cardno Inc.

28 June 2019

PENDOLEY ENVIRONMENTAL

MARINE CONSERVATION ENVIRONMENTAL SERVICES

DOCUMENT CONTROL INFORMATION

TITLE: PERDAMAN UREA PROJECT: MARINE FAUNA DESKTOP ASSESSMENT

Disclaimer and Limitation

This report has been prepared on behalf of and for the use of Cardno, Inc. Pendoley Environmental Pty Ltd. takes no responsibility for the completeness or form of any subsequent copies of this Document. Copying of this Document without the permission of Cardno, Inc. is not permitted.

Document History

Revision	Description	Date issued	Date received	Personnel
Draft	Report Draft	16/05/19		A Knipe
Rev IA	Internal Review	17/05/19	16/05/19	K Pendoley
Rev A	Client review	19/06/19	24/05/19	Cardno
Rev 0	Final report issued	25/06/19		A Knipe

Printed:	28 June 2019
Last saved:	28 June 2019 02:40 PM
File name:	P:\06 Projects\J66 Cardno\05 Programs\J66001 Perdaman Desktop Assessment_2019\05 Technical Reports\RevA\J66001 Perdamen Marien Fauna Desktop Assessment_Rev0.docx
Author:	Annabel Knipe
Project manager:	Kellie Pendoley
Name of organisation:	Pendoley Environmental Pty Ltd
Name of project:	Perdaman Urea Project: Marine Fauna Desktop Assessment
Client	Cardno
Client representative:	Dan Hunter
Report number:	J66001

TABLE OF CONTENTS

1 Introduction 1
1.1 Objectives 1
2 Potential Impacts 2
2.1 Artificial Light 2
2.1.1 Zooplankton 2
2.1.2 Fish 2
2.1.3 Marine Mammals 2
2.1.4 Marine Reptiles 3
2.1.5 Birds 4
3 Marine Fauna 6
3.1 Marine Birds 6
3.1.1 Seabirds 6
3.1.2 Shorebirds 7
3.2 Marine Turtles 12
3.2.1 Mating, Nesting and Internesting Habitat in the Dampier Archipelago 12
3.2.2 Non-Breeding Habitat Use in the Dampier Archipelago 13
4 Impact Assessment 15
4.1 Recommendations 16
5 Mitigative and Offset Measures 17
5.1 Mitigation Measures 17
5.2 Offset Measures 17
6 References 19

LIST OF TABLES

Table 1: Seasonal presence of seabirds, and other marine birds, in the Dampier Archipelago 8
Table 2: Sightings (s) and breeding (b) of EPBC listed threatened/migratory shorebirds and seabirds on islands of the Dampier Archipelago (CALM, 1990; BirdLife International, 2019; Higgins and Davies, 1996) 9
Table 3: Records of nesting behaviour of EPBC listed marin turtles on islands of the Dampier Archipelago (CALM, 1990; Pendoley et al 2016) 14
Table 4: Peak activity of nest females and emerging hatchlings of green, flatback and hawksbill turtles in eth North West Shelf region. 14

LIST OF FIGURES

Figure 1: Islands of the Dampier Archipelago 11

LIST OF APPENDICES

Appendix 1: Development Envelope for the Perdamen Urea Project
Appendix 2: EPBC listed threatened and/or migratory marine species

1 Introduction

Perdaman Chemicals and Fertilisers Pty Ltd (Perdaman) plans to construct and operate a urea plant on Sites C and F within a Development Envelope in the Burrup Strategic Industrial Area (BSIA) on the Burrup Peninsula (Appendix 1). The urea product will be transported by closed conveyor from the plant to Dampier Port, where new urea export facilities will include storage shed, ship loader and conveyor. Environmental approvals for the conveyor, storage and loadout facilities will be the responsibility of Perdaman, Dampier Port Authority will be responsible for the shipping berths.

The Environmental Protection Authority (EPA) determined that the Perdaman Urea Project is to be assessed under Part IV of the Environmental Protection Act 1986 (EP Act). A referral under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), submitted to the Commonwealth Department of the Environment and Energy (DoEE), was deemed a controlled action (accredited assessment). Subsequently, an Environmental Review Document (ERD) is required to address matters of relevance for environmental impact assessment pursuant to both the EP Act and EPBC Act.

1.1 Objectives

As part of the ERD, consideration of impacts to marine fauna is required. The objectives of this report are to:

- Describe the marine fauna likely to be impacted by the Perdaman Urea Project, including identification of critical habitat and ecological windows for affected species.
- Assess the values and significance of marine fauna likely to be impacted by the Perdaman Urea Project in both a local and regional context.
- Quantify the likely direct, indirect and cumulative impacts to marine fauna in terms of the extent, duration and severity.
- Advise on proposed mitigation measures and monitoring strategies to avoid and/or minimise impacts on marine fauna.
- Advise on appropriate offsets in case residual impacts cannot be avoided, reduced, mitigated or subsequently restored.

Locations considered in scope include the Development Envelope (Appendix 1), coastal waters of the Dampier Archipelago and any regional island rookery assessed as at-risk.

2 POTENTIAL IMPACTS

The draft Perdaman Urea Project Environmental Scoping Document (Cardno, 2019) identifies introduction of marine pests, accidental discharges, underwater noise during construction and artificial light as potential impacts and risks to marine fauna from the Project. Activities that could result in introduction of marine pests, accidental discharges to the marine environment or underwater noise emissions are those associated with construction of shipping berths which are not within the scope of Perdaman's approvals and are not discussed further. Artificial light associated with the onshore facilities (production plant and port facilities) has the potential to impact marine fauna as described below.

2.1 Artificial Light

Artificial light at night can alter critical behaviours in wildlife. For some species, artificial lighting may extend diurnal or crepuscular behaviours by improving an animal's ability to forage (e.g. Hill 1990). For nocturnal species, artificial light can result in detrimental changes in behaviour.

2.1.1 Zooplankton

Diel vertical migration (DVM) is an omnipresent phenomenon in plankton communities whereby plankton migrate to surface waters at dusk and return to deeper waters at dawn (see Hays, 2003) for review). Although evidence has shown that DVM also occurs in the deep sea where no direct and background sunlight penetrates (van Haren & Compton, 2013), light levels in the water column are thought to be strong cues for DVM (Hays, 2003). These vertical migrations of zooplankton are integral to structuring pelagic communities since they influence the behaviour of predators (Hays, 2003). Gliwicz (1986) reports high predation of zooplankton by fish during nights when the full moon rose hours after sunset. While Gliwicz (1986) describes a natural occurrence, it is possible to infer that artificial light spill could attract predatory species and/or disrupt predator–prey interactions.

2.1.2 Fish

Behavioural responses of fish to artificial light have been demonstrated in various fish species (Marchesan et al. 2005). Aggregation of both small, shoaling fish, and large predatory fish, was detected in estuarine habitat in response to increased artificial lighting (Becker et al., 2013). Since many predatory fish rely on visual cues to locate and capture prey, increased light can lead to changes in predator-prey interactions. For example, the proportion of herring *Clupea harengus* feeding increased with prey density in high light intensity experiments, while under dark conditions, increased food availability failed to trigger a similar increased feeding response (Batty et al., 1990).

2.1.3 Marine Mammals

There is a paucity of research investigating the effects of artificial lighting on marine mammals and direct effects of artificial lighting on cetaceans and dugongs have not been reported. Many dolphin species are thought to be diurnal, or at least more active during the day, possibly related to prey availability (Sekiguchi & Kohshima 2003). Since fish species may pool in areas of light spill, dolphins may be indirectly attracted to lit structures or illuminated marine environments for foraging purposes.

As herbivores, dugongs will be less likely affected by artificial lighting influencing food availability. In addition, dugongs feed both diurnally and nocturnally depending on the region (Ichikawa et al. 2006), with feeding generally constrained by tidal range (Anderson & Birtles, 1978) rather than light availability. Research reporting direct effects of artificial lighting on dugongs is lacking.

Since mammals use variations in the length of day to anticipate environmental changes and time their reproduction, light pollution which affects day length perception could lead to changes in biological functions. However, the extent to which this occurs will be dependent on the fidelity of individuals and populations to an artificially lit area.

2.1.4 Marine Reptiles

2.1.4.1 Seasnakes

Documentation of the effects of artificial lighting on sea snakes is lacking. However, as active and intensive foragers, that display prolonged episodes (weeks) of continuous effort in search of prey (Bonnet, 2012), sea snakes may be attracted to well-lit areas around marine infrastructure due to the associated attraction of prey species.

2.1.4.2 Marine turtles

Adverse effects of artificial light on marine turtle behaviour is well recognised by a substantial body of research (see Withington and Martin, 2003; Lohmann et al., 1997; Salmon, 2003 for reviews). Artificial lighting can impact individuals at different stages of the life cycle, including nesting adult females and hatchlings.

Adult female marine turtles return to land, predominantly at night, to nest on sandy beaches, relying on visual cues to select, and orient on, nesting beaches. Artificial lighting on or near beaches has been shown to disrupt nesting behaviour (see Witherington and Martin, 2003 for review). Beaches with artificial light, such as urban developments, roadways and piers, often have lower densities of nesting females compared to beaches with less development (Salmon, 2003; Hu et al., 2018).

Hatchling turtles emerge from the nest, typically at night (Mrosovsky & Shettleworth, 1968), and must rapidly reach the ocean to avoid predation (Salmon 2003). Hatchlings locate the ocean using a combination of topographic and brightness cues, orienting towards the lower, brighter oceanic horizon, and away from elevated darkened silhouettes of dunes and/or vegetation behind the beach (Pendoley & Kamrowski, 2015; Lohmann et al 1997; Limpus & Kamrowski 2013).

Artificial lights interfere with natural light levels and silhouettes disrupting hatchling sea finding behaviour (Withington and Martin, 2003; Pendoley & Kamrowski, 2015; Kamrowski, et al., 2014). Hatchlings may become disorientated - where hatchlings crawl on circuitous paths; or misorientated - where they move in the wrong direction, possibly attracted to artificial lights (Withington and Martin, 2003; Lohmann et al., 1997; Salmon 2003). On land, movement of hatchlings in a direction other than the sea often leads to death from predation, exhaustion or dehydration.

Once in nearshore waters, artificial lights on land can also interfere with the dispersal of hatchlings. Lights can slow down their in-water dispersal (Witherington & Bjorndal, 1991; Wilson et al., 2018), increase their dispersion path or even attract hatchings back to shore (Truscott et al., 2017). In addition to interfering with swimming, artificial light can influence predation rates, with increased

predation of hatchlings in areas with significant sky glow (Gyuris 1994; Pilcher et al 2000). Since the nearshore area tends to be predator-rich, hatchling survival may depend on them exiting this area rapidly (Gyuris, 1994). Should this be the case, aggregation of predatory fish occur in artificially lit areas (see Section 2.1.2 above) may further increase predation of hatchlings.

2.1.5 Birds

2.1.5.1 Seabirds

That seabirds are attracted to artificial light sources is well known, with reports of collisions with lighthouses extending as far back as 1880 (Allen, 1880) and exploitation by humans who used fire to attract seabirds to hunt them for food (Murphy, 1936). More recently artificial light associated with the rapid urbanisation of coastal areas has been linked to increased seabird mortality (Gineste et al., 2016) and today, 56 procellariform species worldwide are known to be impacted by artificial lighting (Rodríguez et al. 2017a; Rodríguez et al. 2017b).

Responses to lighting include collision, entrapment, stranding, grounding, disorientation or interference with navigation (being drawn off course from usual migration route) potentially resulting in injury and/or death. High rates of "fallout", or the collision of birds with structures, has been reported in seabirds nesting adjacent to urban or developed areas (Montevecchi 1998; Rodríguez et al., 2017a). The degree of impact is mediated by a combination of physical, biological and environmental factors including the location, visibility, colour and intensity of the light, its proximity to other infrastructure, landscape topography, moon phase, atmospheric and weather conditions and the life stage of the bird.

Seabirds that are active at night while migrating, foraging or returning to colonies can be impacted directly. Indirect impacts to seabirds may arise from artificial light extending daytime activities of diurnal predators such as gulls, increasing predation risk and impacting colony attendance.

Among species with a nocturnal component to their life cycle, such as procellariforms (shearwaters, petrels and albatrosses), artificial light impacts adult and fledgling life-stages differently. Adult procellariforms are vulnerable to fall out or predation when returning to and leaving the nesting colony. A recent study shows artificial light disrupts adult nest attendance and thus affects weight gain in chicks (Cianchetti-Benedetti et al., 2018). Fledglings are more vulnerable to artificial light than adults due to the naivety of their first flight, the immature development of ganglions in the eye at fledging and the potential connection between light and food (Montevecchi, 2006; Mitkus et al., 2016). The bulk of the literature concerning impacts of lighting upon seabirds relate to the synchronised mass exodus of fledgling seabirds from their nesting sites (Deppe et al., 2017; Raine et al., 2007; Rodriguez et al., 2015a; Rodriguez et al., 2015b; Le Corre et al., 2002; Reed et al., 1985). For example, fledging procellariforms depart the nesting colony for the sea under the cover of darkness (Warham, 1990) which may increase vulnerability to impacts from artificial lighting (Reed et al., 1985). Artificial lights are thought to override the sea-finding cues provided by the moon and star light at the horizon (Telfer et al., 1987) and fledglings can be attracted back to onshore lights after reaching the sea (Podolsky, 1998; Rodriguez et al., 2014). It is possible that artificial lighting effects the ability of fledglings to imprint upon their natal colony, preventing them from returning to nest when they mature (Raine et al., 2007), with currently unknown consequences on the viability of a breeding seabird populations (Griesemer and Holmes, 2011).

2.1.5.2 Shorebirds

Artificial lighting has been shown to influence the nocturnal foraging behaviour in shorebirds. Santos et al. (2010) demonstrated improved foraging success by three species of plover and two species of sandpiper by exploiting sites where streetlights provided extra illumination. Similarly, Dwyer et al. (2013) showed artificial light generated from a large industrial site significantly altered the foraging strategy of common redshanks within an estuary. The greater nocturnal illumination of the estuary from the industrial site permitted common redshanks to forage for extended periods using a visual foraging strategy, which was deemed a more effective foraging behaviour when compared to tactile foraging (Dwyer et al., 2013).

However, artificial light may also act as a bird-deterrent. Rogers et al. (2006) suggested that nocturnal shorebird roost sites were selected with low exposure to artificial lighting (e.g. streetlights and traffic), and where the risk of predation is perceived to be low (Rogers et al., 2006). Additionally, the density of black-tailed godwit nests in wet grasslands has been reported to be significantly lower within 300 m of light sources (De Molenaar et al., 2000). Furthermore, the overall density of shorebirds in suitable foraging areas is expected to decline with increased distance to the nearest roost, due to the greater energetic cost travelling between areas (De Molenaar et al., 2000). The artificial illumination (or lack thereof) of nocturnal roost sites is therefore likely to significantly influence the abundance of shorebirds in nearby foraging areas.

3 MARINE FAUNA

EPBC listed threatened and/or migratory marine species within 10 km of the Dampier port location were identified via the Protected Matters Search Tool (DoEE, 2019a), and are summarised in Appendix 2.

Of the species identified, the potential impacts of artificial light on seasnakes, marine mammals, sharks and rays are expected to be limited to local aggregation only. Artificial light has the potential to impact turtle and marine bird behaviour, with implications on life-history processes. A such, the following species description and impact assessment is focussed on potential impacts of the Perdaman Urea Project on marine birds and turtles only.

3.1 Marine Birds

A number of listed threatened and/or migratory marine birds may occur in and around islands of the Dampier Archipelago (Appendix 2).

3.1.1 Seabirds

Several species of threatened and/or migratory seabird may occur in the waters of the Dampier Archipelago (Appendix 2). Some species, such as the streaked shearwater, are non-breeding visitors to Australian waters, for others, such as the southern giant petrel, lesser frigate bird and common noddy, breeding occurs in Australia but has not been recorded at the Dampier Archipelago. For these species, the waters of the Dampier Archipelago may provide foraging habitat during non-breeding periods or for juvenile birds yet to reach sexual maturation. Seasonality of likely presence in the Dampier Archipelago is summarised in Table 1.

Four seabird species, the wedge-tailed shearwater, Caspian tern, roseate tern and Australian fairy tern, are known to breed on islands of the Dampier Archipelago (Table 2). For all except the Caspian tern, the area has been recognised as Biologically Important Areas (BIAs) based on known breeding activity (DoEE, 2019).

The wedge-tailed shearwater is a common breeding visitor to the Pilbara (Johnstone et al., 2013), and has been recorded breeding on several islands of the Dampier Archipelago (Johnstone et al., 2013; CALM, 1990), the closest of which is Conzinc Island, 9 km from Dampier Port (Table 2; Figure 1). Adults are absent from their breeding colonies during the interbreeding period and return from their tropical Indian Ocean over-wintering grounds from late June onwards to re-excavate their burrows. This species is highly synchronous in timing of breeding; all eggs within a colony are laid within a ten-day period. They lay their single egg during early November, which is then incubated until the chick hatches (after 53 days) in early January. Once hatched, adults leave the burrows to forage locally during the day returning at night to feed chicks until they are ready to fledge in mid-April (Nicholson 2002; Table 1). Adults may not return to feed chicks each night; in Australia, wedge-tailed shearwater foraging trips have been recorded at 1 – 3 days (Rodney, 2006). Dual foraging strategies, whereby parents alternate or mix short and long trips, have been recorded in several shearwater species (sooty shearwaters (Weimerskirch, 1998), little shearwaters (Booth et al., 2000), Cory's shearwaters (Granadeiro et al., 1998; Magalhães et al., 2008), streaked shearwaters (Ochi et al., 2010), Manx shearwaters (Shoji et al 2015)). It is possible that wedge-tailed shearwaters

breeding on the Dampier Archipelago also exhibit dual foraging strategies comprising short trips in local waters and longer trips at greater distances from the breeding colonies.

The Australian fairy tern has been recorded breeding at several islands of the Dampier Archipelago, the closest being Elphick Nob 20 km from Dampier Port (CALM, 1990; Table 2; Figure 1). Eggs are laid in late July to early Sept (Johnstone et al., 2013) and incubated for approximately 18 days (Higgins & Davies, 1996). Once hatched, chicks are guarded by at least one parent continually until approximately 14–15 days of age (Higgins & Davies, 1996). If breeding fails at one area, the birds will often move to new locations to attempt relaying within the same season (Higgins & Davies, 1996). Colonies tend to occupy areas rather than specific sites, and nest sites are often abandoned after one year, regardless of success (Saunders & de Rebeira, 1985). Australian fairy terns favour sheltered inshore waters and appear to be present around breeding sites throughout the year (Johnstone et al., 2013).

Caspian terns have been recorded breeding on several islands of the Dampier Archipelago (CALM, 1990), the closest being Conzinc Island, 9 km from Dampier Port (Table 2; Figure 1). The typical breeding season is shown in Table 1 (CALM, 1990). Following egg laying, incubation takes approximately 22 days, with chicks fledging after approximately 35 days (DoEE, 2019). Although the species may forage up to 60 km from their nesting site (DoEE, 2019), they favour sheltered seas, flooded coastal samphire flats, brackish pools on lower courses of rivers and saltwork ponds (Johnstone et al., 2013) and therefore are likely to forage in the vicinity of Dampier Port.

Roseate terns have been recorded breeding on Goodwyn Island, 22 km from Dampier Port (Higgins and Davies, 1996; Table 2; Figure 1). Little is known about movement patterns of roseate terns in Australia; they are known to move away from breeding colonies following breeding, but their non-breeding range is not well defined (Higgins & Davies, 1996). They are usually associated with coral reefs and may also forage around islands on the continental shelf. They are rarely recorded foraging in shallow sheltered inshore waters usually venturing into these areas only accidentally, when nesting islands are nearby (Higgins & Davies, 1996). It is possible that roseate terns will forage with waters of the Dampier Archipelago, though habitat preferences suggest they will not be as common as Caspian or Australian fairy terns described above.

3.1.2 Shorebirds

Australia is situated within the East Asian – Australian (EAA) Flyway, a geographic region supporting populations of migratory shorebirds throughout their annual cycle. Of the shorebirds identified in Appendix 2, all but one species (the Australian painted snipe) undertake annual migrations from breeding sites in the northern hemisphere to more southern non-breeding sites within the EAA Flyway (Bamford et al 2008). An approximate annual cycle for shorebirds in the EEA Flyway has been identified as: breeding (May to August); southward migration (August to November); non-breeding (December to February); and northward migration (March to May), although exact timing varies between species (Bamford et al., 2008). Migratory shorebird species are mostly present in Australia during the non-breeding period, in coastal and inland habitats where adult birds build up the energy reserves necessary to support northward migration and subsequent breeding (Commonwealth of Australia, 2017). Within the EEA Flyway, sites of international importance are identified as “a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird” (Ramsar Convention

Bureau, 2000). The Dampier Saltworks, located ~8 km south of the Development Envelope (Figure 1), has been recognised as such as site for the oriental plover and curlew sandpiper (Bamford et al., 2008), the latter of which is listed critically endangered. The Dampier Saltworks has also been recorded supporting large numbers of sharp-tailed sandpiper and is recognised by BirdLife International as an Important Bird Area (BirdLife International, 2019).

The Australian painted snipe is the only shorebird listed in Appendix 2 that breeds in Australia. Females typically breed every two years (del Hoyo et al., 1996; Marchant & Higgins, 1993). The species has been recorded at wetlands in all states of Australia (Barrett et al., 2003; Blakers et al., 1984; Hall, 1910b), however, it is most common in eastern Australia, and there are no records of this species breeding within the Dampier Archipelago.

The coastal fringes of the Burrup Peninsula and Dampier Archipelago contain a range of intertidal habitats including sandy beaches, rocky beaches, sand and mudflats and shallow rock platforms, providing habitat for numerous migratory and resident shorebirds. Table 2 summarises the presence of threatened and/or migratory shorebirds within the Dampier Archipelago.

Table 1: Seasonal presence of seabirds, and other marine birds, in the Dampier Archipelago

Species	J	F	M	A	M	J	J	A	S	O	N	D
Osprey[1]	Non-breeding presence				Breeding known to occur							
Fork tailed swift[2]	Non-breeding presence									Non-breeding presence		
Australian fairy tern[1]	Non-breeding presence							Breeding known to occur				
Southern giant petrel[3]	Low level juvenile presence		Low level juvenile and non-breeding adult presence					Low level juvenile presence				
Common noddy[1]	Presence within water of the Dampier Archipelago											
Wedge-tailed shearwater[1,7]	Breeding known to occur									Breeding known to occur		
Streaked shearwater[4]	Non-breeding presence							Non-breeding presence				
Lesser frigatebird[5]	Non-breeding presence											
Caspian tern[1]	Non-breeding presence						Breeding known to occur					
Roseate tern[6]								Breeding known to occur				

[1]CALM, 1990
[2]Higgins, 1999
[3]DSEWPAC (2011)
[4]Marchant, S & Higgins, PJ 1990b
[5]Commonwealth Australia, 2012
[6]Higgins & Davies, 1996
[7]Nicholson, 2002

Table 2: Sightings (s) and breeding (b) of EPBC listed threatened/migratory shorebirds and seabirds on islands of the Dampier Archipelago (CALM, 1990; BirdLife International, 2019; Higgins and Davies, 1996)

Island/ location	Dampier Saltworks	Angel Island	Brigadier Island	Cohen Island	Collier Rocks	Conzinc Island	Delambre Island	Dolphin Island	Eaglehawk Island	East Intercourse Island	Elphick Nob	Egret Island	Enderby Island	Gidley Island	Goodwyn Island	Hauy Island	High Point	Keast Island	Kendrew Island	Lady Nora Island	Legendre Island	Malus Island	Millers Rock	Nelson Rocks	Roly Rocks	Rosemary Island	West Lewis Island
Approx. distance to Dampier Port (km)	8	12	23	23	26	9	38	13	31	6	20	33	17	21	22	30	11	25	26	21	28	12	22	20	28	20	10
Shorebirds																											
Red Knot									s																		
Curlew sandpiper	s							s					s														
Greater sand plover								s												s		s					
Lesser sand plover								s					s			s				s						s	
Bar-tailed godwit		s						s	s																		
Common sandpiper								s					s														s
Ruddy turnstone		s		s		s	s	s	s	s	s		s			s		s	s	s			s			s	s

Island/ location	Dampier Saltworks	Angel Island	Brigadier Island	Cohen Island	Collier Rocks	Conzinc Island	Delambre Island	Dolphin Island	Eaglehawk Island	East Intercourse Island	Elphick Nob	Egret Island	Enderby Island	Gidley Island	Goodwyn Island	Hauy Island	High Point	Keast Island	Kendrew Island	Lady Nora Island	Legendre Island	Malus Island	Millers Rock	Nelson Rocks	Roly Rocks	Rosemary Island	West Lewis Island
Sharp-tailed sandpiper	s								s				s														
Red-necked stint								s																		s	
Oriental plover	s												s							s							
Whimbrel		s	s										s	s						s	s			s			
Grey plover								s	s																		
Grey-tailed tattler				s		s		s					s		s						s	s					
Seabirds																											
Australian fairy tern				s	s		s				b				b			s	b	s			s	s	s		
Wedge-tailed shearwater				b	b	b	b				b				b	b			b	b	b	b			b		
Caspian tern			s	b		b	s	s				b	b		s			b	s	b		s		s	s	b	s
Roseate tern								s					s		b												

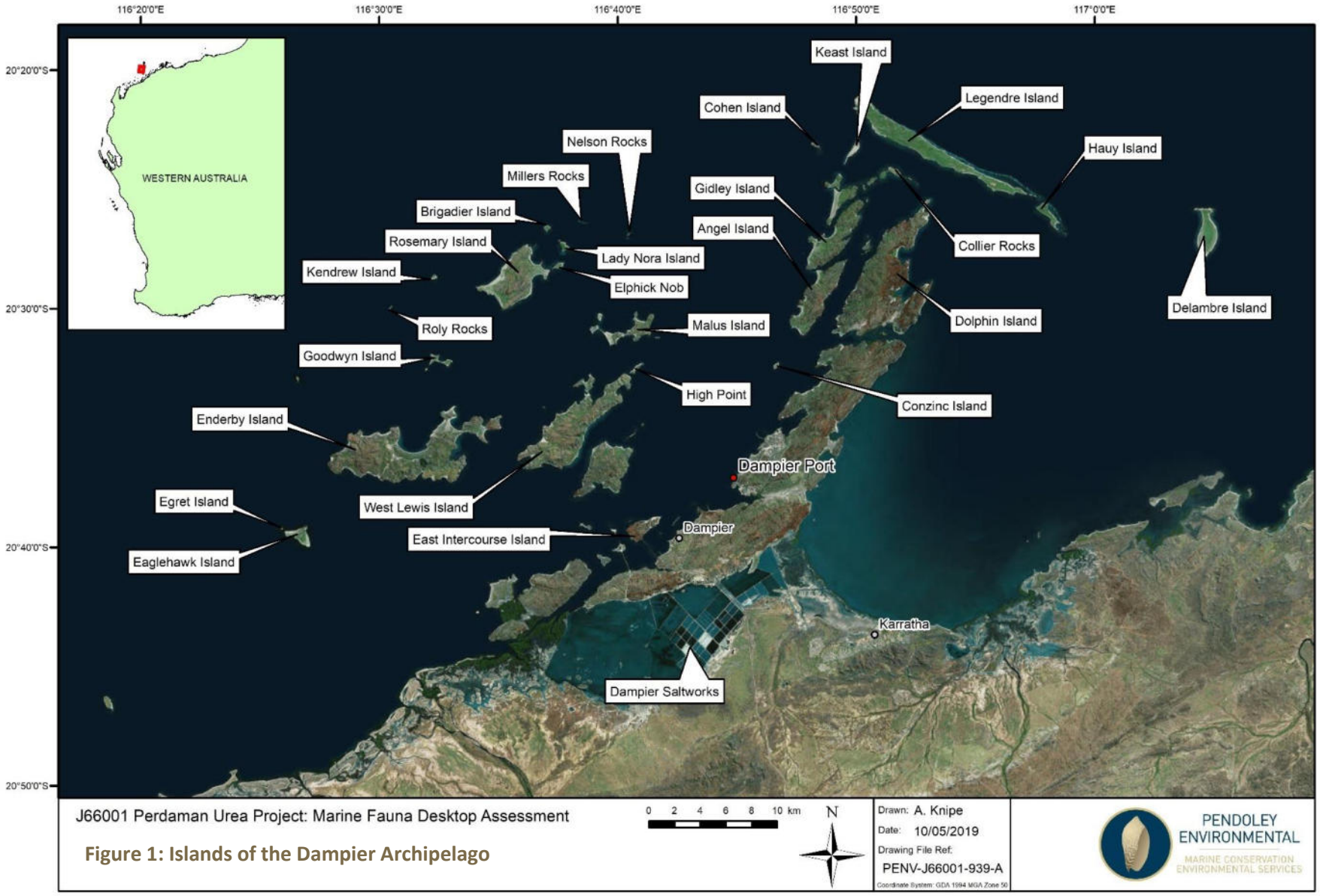


Figure 1: Islands of the Dampier Archipelago

3.2 Marine Turtles

All marine turtle species share a very similar life cycle pattern, including a breeding migration from foraging areas to mating and nesting areas. During the breeding period, males and females will migrate to the mating areas, which may or may not be close to the nesting beach (Miller 1997, Hamann et al., 2002) and typically demonstrate strong site fidelity, laying each of their clutches on the same beach or island. After mating, the males return to the foraging areas while the females will spend several months at the nesting area, laying multiple clutches of eggs. Between nesting, females will move to internesting areas. As capital breeders, marine turtles are understood to show inactive behaviour during the internesting period (the period between a successful clutch and the next nesting attempt) (Hays et al., 1999, Fossette et al., 2012), presumably to conserve energy for successive reproductive events (see Hays et al. 1999). Once the last clutch of eggs is laid, females will return to the foraging areas, building up their fat reserves before the next breeding migration. Most females will not nest in consecutive years (Miller, 1996). Flatback turtles have a slightly different life cycle to this generalised sea turtle life cycle, as they do not have an oceanic phase. Juveniles grow to maturity in shallow coastal waters, thought to be close to their natal beaches (Musick & Limpus, 1996). Parmenter (1994) and Whittock et al (2016) suggest flatback turtles engage in long distance migrations between feeding grounds and remote nesting beaches.

3.2.1 Mating, Nesting and Internesting Habitat in the Dampier Archipelago

Significant nesting and aggregation areas for marine turtles within the Dampier Archipelago were reported by CALM (2005) and identified as critical habitat in The Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth Australia, 2017).

Turtle nesting activity has been observed on a number of islands of the Dampier Archipelago, as summarised in Table 3 (CALM, 1990; Pendoley et al. 2016). Furthermore, turtle nesting has been recorded, albeit in low numbers, at two beaches on the Burrup Peninsular in close proximity to Dampier Port (Holden Beach and No Name Bay (Woodside, 2018)). Although Table 3 indicates loggerhead turtle nesting activity on Cohen Island (CALM, 1990), Pendoley et al (2016) did not find any evidence of loggerhead nesting activity in over 20 years of track data. The northern most key loggerhead nesting areas include the North West Cape and Muiron Islands and any nesting activity by loggerhead turtles in the Dampier Archipelago will not represent significant rookeries for this species. No major leatherback turtle rookeries are known to occur in Australia, with scattered nesting reported in Queensland (Limpus & MacLachlan 1979, 1994; Limpus et al. 1984b) and the Northern Territory (Hamann et al. 2006; Limpus & MacLachlan 1994) only.

Within the Dampier Archipelago, Rosemary Island, 20 km form Dampier Port, has the most significant nesting beaches, determined as mean number of hawksbill, green and flatback turtle tracks per day (Pendoley et al 2016) and is recognised as an internationally significant rookery for hawksbill turtles. Other islands that also had moderate nesting activity (11 – 100 tracks per day) for all three species, include Delambre Island, Enderby Island, Eaglehawk Island and Angel Island (Pendoley et al 2016), 38 km, 17 km, 31 km and 12 km from Dampier Port respectively. Delambre Island has been recognised as the largest flatback turtle rookery in Australia with an estimated 3500 nesting females per year (Chaloupka, 2018).

Although the body of literature describing marine turtle movement patterns during the breeding season is increasing, information specific to the Dampier Archipelago is more limited. Pendoley (2005) provides details of tracking data for green and hawksbill turtles nesting on Rosemary Island. Results suggested that nesting female hawksbill turtles remained within 1 km of nesting beaches on Rosemary Island (Pendoley, 2005). Female green turtles travelled greater distances, up to 5 km, but typically remained within shallow, nearshore waters between 0 and 10 m deep (Pendoley, 2005).

Studies on the movements of internesting flatback turtles nesting within the Dampier Archipelago are lacking. However, internesting movements have been investigated at Barrow Islands and mainland Australia. Compared to green and hawksbill turtles, flatback turtle internesting movements extend further offshore and up to 62 km from nesting beaches, primarily in a longshore direction or from islands towards the mainland (Whittock, Pendoley and Hamann, 2014). Other studies have showed flatback turtles travelled at least 26 km and up to 48 km in all directions from nesting beaches on the Lacepede Islands during internesting (Waayers et al. 2011). Given the distances travelled at other flatback turtle rookeries, it is possible that internesting females could occur anywhere in the waters of the Dampier Archipelgo.

3.2.2 Non-Breeding Habitat Use in the Dampier Archipelago

Non-breeding habitat use may include migratory pathways or foraging areas for loggerhead, green, hawksbill, leatherback and flatback turtles.

During non-breeding, green turtles typically occupy nearshore, coastal bays, feeding on seagrasses and macroalgae (Bjorndal, 1997; Bolten, 2003). They are herbivorous for the majority of their life history; however, post-hatching green turtles are omnivorous in their pelagic stage, and recent findings point to an oceanic diet including sea jellies for some populations (Arthur et al., 2008; Bolten, 2003). Flipper tagging data suggest WA waters are probable foraging grounds for green turtles that nest not only in WA, but also the Northern Territory and Indonesia (Prince, 1997). Flatback turtle foraging areas have been found to occur in waters shallower than 130 m and within 315 km of the shore, with many areas located in 50 m water depth and 66 km from shore (Whittock et al., 2016). Their main diet comprises algae, squid, invertebrates, and molluscs. Loggerheads feed on benthic invertebrates including molluscs and crustaceans (Shigenaka, 2003). Loggerhead turtles are a nearshore species who prefer warm, shallow continental shelves and coastal bays and estuaries (Shigenaka, 2003). Hawksbill turtles are the most tropical of all sea turtle species and are found within rock and reef habitats, coastal areas and lagoons. They are known to forage amongst vertical underwater cliffs, on coral reefs and on gorgonian (soft coral) flats, as well as seagrass or algae meadows (Bjorndal, 1996). Hawksbills feed primarily on sponges, but will also consume shrimp, squid, anemones, algae, seagrass, sea cucumber and soft corals (Bjorndal, 1996). Leatherback turtle diet is dominated by gelatinous organisms such as jellyfish, salps, squid and siphonophores (Bjorndal 1997) which influences their distribution (Leary, 1957; Lazell, 1980) both in the open ocean (Lazell, 1980) and close to shore (Hoffman & Fritts, 1982; Suarez, 2000).

Tracking data has highlighted the importance of the Dampier Archipelago for both green and hawksbill turtles on migration, though tracks indicted individuals stayed on the further most islands of the Archipelgo, and the eastern side of the Burrup Peninsular, rather than waters close to Dampier Port (Pendoley, 2005). The tracking data from Pendoley (2005) did not identify any foraging grounds for greens and hawksbills within the Dampier Archipelago. However, foraging aggregations

of unidentified sea turtles during a mid-winter aerial marine fauna survey of the North West Shelf region were concentrated in warm shallow waters off the offshore islands (Prince et al., 2001). Since all marine turtle species identified in Appendix 2 can be found in shallow water habitats, it remains plausible that foraging individuals occur within the waters of the Dampier Archipelago.

Table 3: Records of nesting behaviour of EPBC listed marine turtles on islands of the Dampier Archipelago (CALM, 1990; Pendoley et al., 2016)

	Angel Island	Cohen Island	Delambre Island	Dolphin Island	Eaglehawk Island	Elphick Nob	Enderby Island	Goodwyn Island	Hauy Island	Keast Island	Lady Nora Island	Legendre Island	Malus Island	Rosemary Island	West Lewis Island
Approx. distance to Dampier Port (km)	**12**	**23**	**38**	**13**	**31**	**20**	**17**	**22**	**30**	**25**	**21**	**28**	**12**	**20**	**10**
Loggerhead turtle		x													
Green turtle	x	x	x	x	x		x	x	x	x	x	x	x	x	x
Hawksbill turtle	x		x	x	x	x	x	x					x	x	
Flatback turtle			x				x		x	x		x			

Table 4: Peak activity of nest females and emerging hatchlings of green, flatback and hawksbill turtles in the North West Shelf region.

Species	Activity	Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun	
Green	Nesting																								
	Emergence																								
Hawksbill	Nesting																								
	Emergence																								
Flatback	Nesting																								
	Emergence																								

4 IMPACT ASSESSMENT

Artificial light has the potential to directly impact marine fauna including turtles, seabirds and shorebirds in the waters of the Dampier Archipelago. Potential impacts to relevant marine fauna (marine turtles, shorebirds and seabirds) are described in Section 2. In absence of lighting designs and/or modelling estimating the extent of potential light spill, the possibility that additional light associated with the Perdaman Urea Project port facilities resulting in direct light spill of the adjacent waters is credible. Depending on the positioning and height of light fixtures, light spill could occur at turtle nesting habitat at Holden Beach and No Name Bay. Existing development on the north shore of King Bay may already result in direct light spill onto the marine habitats. The Perdaman Urea Project may result in additional light spill from the east (Site C) and north (Site F), resulting in a cumulative increase in the extent and severity of light spill. In addition, the proposed location of Site C and F occur on currently undeveloped land increasing the overall area of development on the Burrup Peninsular, and consequently, the artificial light footprint.

Turtles are most at risk from impacts during nesting, hatchling emergence and at-sea dispersal. Low level turtle nesting has been recorded at Holden Beach and No Name Bay, ~0.5 – 1 km from the Development Envelope. Should additional light spill occur on these beaches, or an increase in glow occur on the horizon, nesting by females may be disrupted. Additionally, the presence of nesting females suggests that females and post-dispersal hatchlings will occur in waters subjected to potential direct light spill from the port facilities. This may lead to decreased hatchling survival due to disorientation at sea, entrapment and increased predation. Given the size of the nesting population at these beaches (Woodside, 2018), impacts are unlikely to result in population-level effects.

Fledgling seabirds and adults returning to colonies may also be attracted to the additional lighting, resulting in collision and potential injury of individuals, or in disruption of breeding and foraging behaviours, with consequences on breeding success. The closest known seabird breeding sites to Dampier Port occur on Conzinc Island (9 km from Dampier Port), where wedge-tailed shearwaters and Caspian terns have been recorded breeding. At this distance, impacts to fledglings making their first flight are unlikely to be significantly disorientated from light associated with the Perdaman Urea Project. However, adult birds are known to forage at greater distances from the nesting sites. Should artificial light effect foraging ability or result in injury or death, survival of chicks may be compromised.

Habitats in King Bay include mudflats and mangroves, which could be used by shorebirds for foraging and roosting, though evidence of this has not been recorded. Potential impacts of light spill on these marine habitats could include increased foraging through improved light conditions, or displacement from nocturnal nesting sites. Migrating shorebirds, flying over the area, may be attracted to the light from the port facilities, and Sites C and F, disorientating them away from key foraging and roosting grounds.

Artificial light associated with the port facilities of the Perdaman Urea Project may also effect fish and zooplankton (Section 2) leading to community level effects, indirectly impacting marine turtles, seabirds and shorebirds through changes in predator and/or prey distribution and abundance.

Considering the size and extent of the proposed Development Envelope, additional artificial light is unlikely to result in impacts over and above those occurring from the existing light sources at Dampier Port and across the Burrup Peninsular. However, the additional lighting will contribute to the overall light pollution levels in the Dampier Archipelago, although to what extent is difficult to quantify in absence of detailed lighting designs, including number, intensity and specification of lights proposed. As development increases, glow, as seen from islands potentially up to 20 km away, may become brighter and occupy a larger proportion of the horizon. Considered cumulatively, light glow from industrial development on the Burrup has potential to impact more significant marine turtle and seabird nesting sites on islands of the Dampier Archipelago.

4.1 Recommendations

The following recommendations would better inform the above impact assessment:

- Development of detailed lighting plans including descriptions of lighting designs, including number and specification of lights proposed to better understand the intensity and extent of biologically meaningful light on the surrounding area, taking into account natural topography.

5 MITIGATIVE AND OFFSET MEASURES

5.1 Mitigation Measures

Considering the outcomes of the impact assessment and recommendations, the following points should be considered in the development of preventative and mitigative control measures, with respect to lighting design and management:

- Light placement

Maintain any natural barriers (e.g. dune and/or vegetation screen) present between turtle nesting beaches (e.g. Holden Beach), seabird nesting sites and shorebird nocturnal foraging/roost areas (if present), and sources of artificial light. Maintaining a dark buffer zone between seabird nesting and shorebird nocturnal foraging/roost habitats (if present) and sources of artificial light, would reduce potential disturbance.

- Direction of lighting

Aim external light downwards onto the exact surface area requiring illumination. The use of shielding on lights to prevent vertical light spill upwards, reducing visibility to overflying migrating shorebirds, and outside the footprint of the target area away from nesting beaches and open water. In buildings, use window coverings to contain internal light.

- Light specifications

Avoid lights high in blue light, such as; metal halides, fluorescent, halogens, mercury vapour and most LEDs. Avoid white LEDs or only use LEDs filtered or manufactured to reduce the amount of short wavelength blue light. If possible, the use of intermittent lights, instead of fixed beam, should be considered.

- Lighting management plan

A lighting management plan should be developed for implementation during the operational phase of the project, ensuring that the above points are considered in ongoing operations and in any maintenance, repair or modification activities. Adaptive management controls should also be considered, for example, if grounded birds are encountered, implementation of a rescue plan has been shown to reduce mortality.

5.2 Offset Measures

To further our understanding of marine fauna habitat use in the Dampier Archipelago in areas of high industry presence, collaborative studies involving local industry operators and proponents, Government and research institutions could include:

- Light monitoring at islands throughout the Dampier Archipelgo to assess the relative visibility and scale of the night sky illuminated by light associated with industrial development on the Burrup Peninsula.

- Surveys to identify significant areas of nesting, foraging and/or roosting sites for seabirds and shorebirds on islands of the Dampier Archipelago to provide updated knowledge regarding distribution and abundance of listed marine bird species.
- Turtle satellite tracking studies to better understand habitat use of adult marine turtles during breeding and non-breeding within waters of the Dampier Archipelago, and interactions with industry.
- Hatchling orientation studies on regional Dampier Archipelago beaches to better understand the impact of existing industry lighting on hatchling sea finding from nesting beaches.
- Hatchling dispersal studies to better understand fate of hatchlings post-sea finding and interactions with industry.

6 REFERENCES

ALLEN, J.A., Destruction of birds by light-houses. Bulletin of the Nuttall Ornithological Club 1880. 5: p. 131-138.

ANDERSON P, and BIRTLES A (1978) Behaviour and Ecology of the Dugong, *Dugong Dugon* (Sirenia): Observations in Shoalwater and Cleveland Bays, Queensland. Wildlife Research 5: 1-23.

ARTHUR, K.E., BOYLE, M.C., & LIMPUS, C.J. (2008) Ontogenetic changes in diet and habitat use in green sea turtles (*Chelonia mydas*) life history. Marine Ecology Progress Series, 362, 303-311.

BAKER, A.J., S.L. PEREIRA, D.I. ROGERS, R. ELBOURNE & C.J. HASSELL (2007). Mitochondrial-DNA evidence shows the Australian Painted Snipe is a full species, *Rostratula australis*. Emu. 107 Iss 3:185-189.

BAMFORD M, WATKINS D, BANCROFT W, TISCHLER G AND J WAHL. (2008). Migratory Shorebirds of the East Asian - Australasian Flyway; Population Estimates and Internationally Important Sites. Wetlands International - Oceania. Canberra, Australia.

BARRETT, G., A. SILCOCKS, S. BARRY, R. CUNNINGHAM & R. POULTER (2003). The New Atlas of Australian Birds. Melbourne, Victoria: Birds Australia.

BATTY, R.S., BLAXTER, J.H.S. & RICHARD, J.M. (1990) Light intensity and the feeding behaviour of herring, *Clupea harengus*. Marine Biology, 107, 383– 388.

BECKER A, WHITFIELD AK, COWLEY PD, JÄRNEGREN J, and NÆSJE TF (2013) Potential effects of artificial light associated with anthropogenic infrastructure on the abundance and foraging behaviour of estuary-associated fishes. Journal of Applied Ecology 50: 43-50.

BIRDLIFE INTERNATIONAL (2019) Important Bird Areas factsheet: Dampier Saltworks. Downloaded from http://www.birdlife.org on 07/05/2019.

BJORNDAL, K.A. (1996). Foraging Ecology and Nutrition in Sea Turtles. In The Biology of Sea Turtles (eds P.L. Lutz & J.A. Musick), Vol. 1, pp. 199-231. CRC Press, Boca Raton.

BJORNDAL, K.A. (1997). Foraging Ecology and Nutrition in Sea Turtles. In The Biology of Sea Turtles (eds P.L. Lutz & J.A. Musick), Vol. 1, pp. 199-231. CRC Press, Boca Raton.

BOLTEN, A.B. (2003). Variation in Sea Turtle Life History Patterns: Neritic vs Oceanic Developmental Stages. In The Biology of Sea Turtles, Volume II (eds P.L. Lutz, J.A. Musick & J. Wyneken), Vol. 2, pp. 243-257. CRC Press, Boca Raton.

BOOTH, A. M., MINOT, E. O., FORDHAM, R. A. AND IMBER, M. J. (2000). Co-ordinated food provisioning in the Little Shearwater *Puffinus assimilis haurakiensis*: a previously undescribed foraging strategy in the Procellariidae. Ibis142, 144-146

CALM. 2005. Indicative Management Plan for the Proposed Dampier Archipelago Marine Park and Cape Preston Marine Management Area. Department of Conservation and Land Management, Western Australia.

CARDNO (2019) Perdaman Urea Project – Environmental Scoping Document. Rev 4.4.

CHALOUPKA, M. (2018) presentation to DBCA / NWS committee 8/5/2018. https://rstudio-pubs-static.s3.amazonaws.com/448533_0eb04559be1c4df4934c9f69b22b9256.html

CIANCHETTI-BENEDETTI M., BECCIU P., MASSA B., DELL'OMO G. (2018) Conflicts between touristic recreational activities and breeding shearwaters: short-term effect of artificial light and sound on chick weight. European Journal of Wildlife Research . https://doi.org/10.1007/s10344-018-1178-x.

COMMONWEALTH AUSTRALIA (2012) Species group report card – seabirds. Supporting the marine bioregional plan for the North Marine Region prepared under the Environment Protection and Biodiversity Conservation Act 1999

COMMONWEALTH OF AUSTRALIA (2017) EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species,.

DE MOLENAAR JG, JONKERS DA & SANDERS ME (2000) Road illumination and nature. III Local influence of road lights on a Black-tailed Godwit (Limosa l. limosa) population. ALTERRRA - Research Institute for the Green World.

DEL HOYO, J., A. ELLIOTT & J. SARGATAL, EDS. (1996). Handbook of the Birds of the World. Volume 3, Hoatzin to Auks. Barcelona: Lynx Edicions.

DEPARTMENT OF SUSTAINABILITY, ENVIRONMENT, WATER, POPULATION AND COMMUNITIES (2011), Background Paper, Population Status and Threats to Albatrosses and Giant Petrels Listed as Threatened under the Environment Protection and Biodiversity Conservation Act 1999. Commonwealth of Australia, Hobart

DEPPE L., ROWLEY O., ROWE L.K., SHI N., MCARTHUR N., GOODAY O., GOLDSTIEN S.J. (2017) Investigation of fallout events in Hutton's shearwaters (Puffinus huttoni) associated with artificial lighting. Notornis. 64(4): p. 181-191.

DIAS, M.P., GRANADEIRO J.P., LECOQ M. SANTOS C.D., PALMEIRIM J.M. (2006) Distance to high-tide roosts constrains the use of foraging areas by dunlins: Implications for the management of estuarine wetlands. Biological Conservation. 131: p. 446-452.

DoEE (2019) Department of the Environment and Energy. Protected Matters Search Tool https://www.environment.gov.au/epbc/protected-matters-search-tool

DWYER, R.G., BEARHOP S., CAMPBELL H.A., BRYANT D.M. (2013) Shedding light on light: benefits of anthropogenic illumination to a nocturnally foraging shorebird. Journal of Animal Ecology. 82: p. 478-485.

GINESTE, B., SOUQUET, M., COUZI, F.X., GILOUX Y., PHILIPPE J-S., HOARAU C., TOURMETZ J., POTIN G., LE CORRE M. (2016) Tropical shearwater population stability at Reunion Island, despite light pollution. Journal of Ornithology. 158: p. 385-394.

GLIWICZ, ZM . 1986. A lunar cycle in zooplankton. Ecology 67: 883– 97.

GRANADEIRO, J. P., NUNES, M., SILVA, M. C. AND FURNESS, R. W. (1998). Flexible foraging strategy of Cory's shearwater, *Calonectris diomedea*, during the chick-rearing period. Animal. Behaviour. 56, 1169-176.

GRIESEMER, A.M. AND N.D. HOLMES, (2011) Newell's shearwater population modeling for Habitat Conservation Plan and Recovery Planning, in Technical Report No. 176. The Hawai`i-Pacific Islands Cooperative Ecosystem Studies Unit & Pacific Cooperative Studies Unit. University of Hawai`i: Honolulu, Hawai`i. p. 68.

GYURIS, E., The rate of predation by fishes on hatchlings of the green turtle (Chelonia mydas). Coral Reefs, 1994. 13: p. 137-144.

HALL, R. (1910b). The southern limit of *Rostratula australis*, Gould. Emu. 10:138.

HAMANN, M., C. LIMPUS, G. HUGHES, J. MORTIMER & N. PILCHER (2006). Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South East Asia. Bangkok: IOSEA Marine Turtle MoU Secretariat.

HAYS G.C. (2003) A review of the adaptive significance and ecosystem consequences of zooplankton diel vertical migrations. Hydrobiologia 503, 163–170

HIGGINS, P.J. & S.J.J.F. DAVIES, EDS (1996). Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons. Melbourne, Victoria: Oxford University Press.

HILL, D. 1990. The impact of noise and artificial light on waterfowl behaviour: a review and synthesis of the available literature. Norfolk, United Kingdom: British Trust for Ornithology Report No. 61.

HOFFMAN, W. & T.H. FRITTS (1982). Sea turtle distribution along the boundary of the Gulf Stream current off eastern Florida. Herpetologica. 38 (3):405-409.

HU, Z., H. HU, AND Y. HUANG. (2018) Association between nighttime artificial light pollution and sea turtle nest density along Florida coast: A geospatial study using VIIRS remote sensing data. Environmental Pollution. 239: p. 30-42.

JOHNSTONE R.E., BURBIDGE A.H., DARNELL J.C. (2013) Birds of the Pilbara region, including seas and offshore islands, Western Australia: distribution, status and historical changes. Records of the Western Australian Museum, Supplement 78: 343–441

KAMROWSKI R.L., LIMPUS C., PENDOLEY K., HAMANN M. (2014) Influence of industrial light pollution on the sea-finding behaviour of flatback turtle hatchlings. Wildlife Research. 41: p. 421-434

LAZELL, J.D. (1980). New England waters: critical habitat for marine turtles. Copeia. 1980 (2):290-295.

LE CORRE, M., OLLIVER A., RIBES S., JOUVENTIN P. (2002) Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean). Biological Conservation. 105: p. 93-102.

LEARY, T.R. (1957). A schooling of leatherback turtles, *Dermochelys coriacea coriacea*, on the Texas Coast. Copeia. 1957 (3):232.

LIMPUS, C.J. & N. MACLACHLIN (1979). Observations on the leatherback turtle, *Dermochelys coriacea* (L.), in Australia. Australian Wildlife Research. 6:105-116.

LIMPUS, C.J. & N. MACLACHLIN (1994). The conservation status of the Leatherback Turtle, *Dermochelys coriacea*, in Australia. In: James, R, ed. Proceedings of the Australian Marine Turtle Conservation Workshop, Gold Coast 14-17 November 1990. Page(s) 63-67. Queensland Department of Environment and Heritage. Canberra: ANCA.

LIMPUS, C.J. AND R.L. KAMROWSKI (2013) Ocean-finding in marine turtles: The importance of low horizon elevation as an orientation cue. Behaviour. 150: p. 863-893.

LIMPUS, C.J., A. FLEAY & M. GUINEA (1984b). Sea turtles of the Capricornia section, Great Barrier Reef. Royal Society Queensland Symposium. Page(s) 61-78

LOHMANN, K.J., WITHERINGTON B.E., LOHMANN C.M.F., SALMON M. (1997) Orientation, navigation, and natal beach homing in sea turtles, in The Biology of Sea Turtles. Volume I, P.L. Lutz and J.A. Musick, Editors., CRC Press: Washington D.C. p. 107-135.

MAGALHÃES, M. C., SANTOS, R. S. AND HAMER, K. C. (2008). Dual-foraging of Cory's shearwaters in the Azores: feeding locations, behaviour at sea and implications for food provisioning of chicks. Mar. Ecol. Prog. Ser. 359, 283-293.

MARCHANT, S & HIGGINS, PJ (eds) 1990b, Handbook of Australian, New Zealand and Antarctic birds, volume 1, part A: ratites to petrels, Oxford University Press, Melbourne.

Marchant, S. & P.J. Higgins, eds. (1993). Handbook of Australian, New Zealand and Antarctic Birds. Volume 2 - Raptors to Lapwings. Melbourne, Victoria: Oxford University Press.

MARCHESAN M, SPOTO M, VERGINELLA L, and FERRERO EA (2005) Behavioural effects of artificial light on fish species of commercial interest. Fisheries Research 73: 171-185.

MILLER, J.D. (1996) Reproduction in Sea Turtles. In The Biology of Sea Turtles (eds P.L. Lutz & J.A. Musick), Vol. 1, pp. 51-81. CRC Press, Boca Raton.

MITKUS M., NEVITT G.A., DANIELSEN J., KELBER A. (2016) Vision on the high seas: spatial resolution and optical sensitivity in two procellariform seabirds with different foraging strategies. Journal of Experimental Biology. 219: p. 3329-3338.

MONTEVECCHI, W.A. (2006) Influences of Artificial Light on Marine Birds, in Ecological consequences of artificial night lighting, C. Rich and T. Longcore, Editors. Island Press: Washington DC. p. 480.

MROSOVSKY, N. AND S.J. SHETTLEWORTH (1968) Wavelength preferences and brightness cues in the water finding behaviour of sea turtles. Behaviour. 32: p. 211-257.

MURPHY, R.C. (1936) Oceanic birds of South America. New York: Macmillan.

NICHOLSON, L.W. (2002). Breeding strategies and community structure in an assemblage of tropical seabirds on the Lowendal Islands, Western Australia. Unpublished PhD Thesis, Murdoch University, Perth, Western Australia.

OCHI, D., OKA, N. AND WATANUKI, Y. (2010). Foraging trip decisions by the streaked shearwater *Calonectris leucomelasdepend* on both parental and chick state. J. Ethol. 28, 313-321. doi:10.1007/s10164-009-0187-3

PECK, D.R., (2002). Local adaptation to in the wedge-tailed shearwater (*puffinus pacifcus* Unpublished PhD Thesis, James Cook Univeristy

PENDOLEY, K. AND R.L. KAMROWSKI (2015) Influence of horizon elevation on the sea-finding behaviour of hatchling flatback turtles exposed to artificial light glow. Marine Ecology Progress Series. 529: p. 279-288.

PENDOLEY, K., WHITTOCK P.A., VITENBERGS A. AND BELL, C. (2016) Twenty years of turtle tracks: marine turtle nesting activity at remote locations in the Pilbara, Western Australia. Australian Journal of Zoology, 2016, 64, 217–226

PILCHER N., ENDERBY S., STRINGELL T., BATEMAN L. (2000) Nearshore turtle hatchling distribution and predation, in Sea turtles of the Indo-Pacific: research management and conservation. Proceedings of the Second ASEAN Symposium and Workshop on Sea Turtle Biology and Conservation, N. Pilcher and G. Ismail, Editors. ASEAN Academic Press: London.

PODOLSKY R., AINLEY D.G., SPENCER G., DEFOREST L., NUR N. (1998) Mortality of Newell's shearwaters caused by collisions with urban structures on Kauai. Colonial Waterbirds. 21: p. 20-34.

PRINCE, R.I.T. (1997) Marine Turtle Conservation: The Links Between Populations in Western Australia and the Northern Australian Region. People and Turtles. In Marine Turtle Conservation and Management in Northern Australia (eds R. Kennett, A. Webb, G. Duff, M. Guinea & G. Hill). Center for Indigenous Natural and Cultural Resource Management, Center for Tropical Wetland Studies, Northern Territory University, Darwin.

RAINE H., BORG J.J., RAINE A., BAIRNER S., BORG CARDONA M. (2007) Light Pollution and Its Effect on Yelkouan Shearwaters in Malta; Causes and Solutions. BirdLife Malta: Malta: Life Project Yelkouan Shearwater.

RAMSAR CONVENTION BUREAU. (2000). Strategic Framework and Guidelines for the Future Development of the List of Wetlands of International Importance. Ramsar Convention Bureau, Gland, Switzerland.

REED, J.R., J.L. SINCOCK, AND J.P. HAILMAN, (1983) Light attraction in endangered procellariform birds: reduction by shielding upward radiation. Auk. 102: p. 377-383.

RODRÍGUEZ, A., B. RODRÍGUEZ, AND J.J. NEGRO, (2015) GPS tracking for mapping seabird mortality induced by light pollution. Scientific Reports. 5(10670).

RODRÍGUEZ, A., BURGAN G., DANN P., JESSOP R., NEGRO J.J., CHIARADIA A. (2014) Fatal attraction of short-tailed shearwaters to artificial lights. PLoS ONE. 9(10): p. e110114.

RODRÍGUEZ A, GARCÍA D, RODRÍGUEZ B, CARDONA E, PARPAL L, PONS P (2015) Artificial lights and seabirds: is light pollution a threat for the threatened Balearic petrels? Journal of Ornithology. 156: p. 893-902.

RODRÍGUEZ A/, HOLMES N.D., RYAN P.G., WILSON K.J., FAULQUIER L., MURILLO Y., RAINE A.F., PENNIMAN J.F., NEVES V., RODRÍGUEZ B., NEGRO J.J., CHIARADIA A., DANN P., ANDERSON T., METZGER B., SHIRAI M., DEPPE L., WHEELER J., HODUM P., GOUVEIA C., CARMO V., CARREIRA G.P., DELGADO-ALBURQUEQUE L., GUERRA-CORREA C., COUZI F.X., TRAVERS M., CORRE M.L. (2017) A global review of seabird mortality caused by land-based artificial lights. Conservation Biology. 31(986-1001).

RODRÍGUEZ, A., MOFFETT, J., REVOLTÓS, A., WASIAK, P., MCINTOSH, R. R., SUTHERLAND, D. R., RENWICK L., DANN P., CHIARADIA, A. (2017) Light pollution and seabird fledglings: targeting efforts in rescue programs. Journal of Wildlife Management, 2017. 81: p. 734-741.

ROGERS, D., BATTLEY, P. F., PIERSMA, T., VAN GIL, J. A., ROGERS, K. G. (2006) High-tide habitat choice: insights from modelling roost selection by shorebirds around a tropical bay. Animal Behaviour. 72(3): p. 563-575

ROGERS, D.I., T. PIERSMA, AND C.J. HASSELL (2006) Roost availability may constrain shorebird distribution: Exploring the energetic costs of roosting and disturbance around a tropical bay. Biological Conservation. 133(2): p. 225-235.

SALMON, M., (2003) Artificial night lighting and sea turtles. Biologist, 2003. 50: p. 163-168.

SANTOS C.D., MIRANDA A.C., SARAIVA S., LOURENÇO P., GRANADEIRO, J.M., PALMEIRIM J. (2010) Effects of artificial illumination on the nocturnal foraging of waders. Acta Oecologica. 36: p. 166-172.

SAUNDERS, D. & P. DE REBEIRA (1985). The Birdlife of Rottnest Island. Guildford: the authors.

SEKIGUCHI Y, AND KOHSHIMA S (2003) Resting behaviors of captive bottlenose dolphins (*Tursiops truncatus*). Physiology & Behavior 79: 643-653.

SHIGENAKA, G. (2003) Oil and sea turtle. Biology, planning and response NOAA.

SHOJI A., ARIS-BROSOU S., FAYET A., PADGET O., PERRINS C., GUILFORD T. (2015) Dual foraging and pair coordination during chick provisioning by Manx shearwaters: empirical evidence supported by a simple model. The Journal of Experimental Biology 218, 2116-2123

SUAREZ, A. (2000). Preliminary data on the sea turtle harvest in the Kai Archipelago, Indonesia. In: 2nd ASEAN Symposium and Workshop on Sea Turtle Biology and Conservation.

TELFER T.C., SINCOCK J.L., BYRD G.V., REED J.R. (1987) Attraction of Hawaiian seabirds to lights: conservation efforts and effects of moon phase. Wildlife Society Bulletin. 15: p. 406-413.

TRUSCOTT, Z., D.T. BOOTH, AND C.J. LIMPUS (2017) The effect of on-shore light pollution on sea-turtle hatchlings commencing their off-shore swim. Wildlife Research. http://dx.doi.org/10.1071/WR16143: p. 127-134.

VAN HAREN H. AND COMPTON T. J. (2013) Diel Vertical Migration in Deep Sea Plankton Is Finely Tuned to Latitudinal and Seasonal Day Length. PLoS ONE PLOS ONE 8(5): e64435.

WARHAM, J. (1990) The Behaviour, Population Biology and Physiology of the Petrels. London: Academic Press.

WEIMERSKIRCH, H. AND CHEREL, Y. (1998). Feeding ecology of short-tailed shearwaters: breeding in Tasmania and foraging in the Antarctic? Mar. Ecol. Prog. Ser. 167, 261-274. doi:10.3354/meps167261

WHITTOCK P.A, PENDOLEY K.L., HAMANN, M. (2014) Internesting distribution of flatback turtles (*Natator depressus*) and industrial development in Western Australia. Endangered Species research. 26, 25-38.

WHITTOCK P.A, PENDOLEY K.L., HAMANN, M. (2016) Flexible foraging: post-nesting flatback turtles on the Australian continental shelf. Journal of Experimental Marine Biology and Ecology. 477, 112 – 119.

WILSON, P., THUMS, M., PATTIARATCHI, C., MEEKAN, M., PENDOLEY, K., FISHER, R., WHITING, S. (2018) Artificial light disrupts the nearshore dispersal of neonate flatback turtles *Natator depressus*. Marine Ecology Progress Series. 600: p. 179-192.

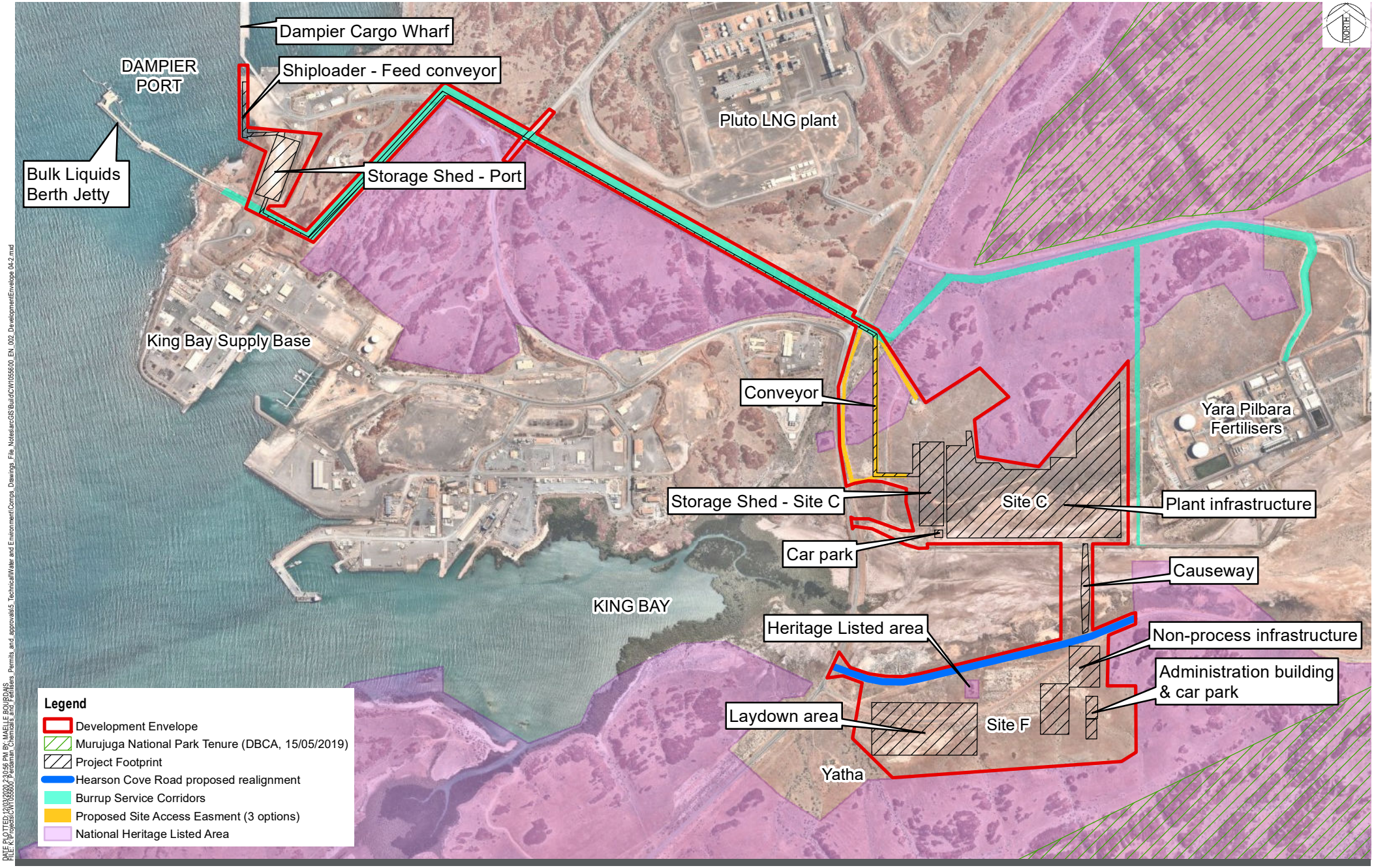
WITHERINGTON, B. AND R.E. MARTIN (2003) Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches. Florida Fish and Wildlife Conservation Commission FMRI Technical Report TR-2: Jensen Beach, Florida. p. 84

WITHERINGTON, B.E. AND K.A. BJORNDAL (1991) *Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles Caretta* caretta. Biological Conservation. 55(2): p. 139-149.

WITHERINGTON, B.E. AND K.A. BJORNDAL (1991) Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles *Caretta caretta*. Biological Conservation. 55(2): p. 139-149.

WOODSIDE (2018) Pluto LNG Project Sea Turtle Management Plan Operations and Maintenance Rev 6 August 2018 https://files.woodside/docs/default-source/our-business---documents-and-files/pluto---documents-and-files/pluto-lng-environmental-compliance-documents/pluto-lng-project---sea-turtle-management-plan.pdf?sfvrsn=3c29ac91_4

Appendix 1: Development Envelope for the Perdaman Urea Project



DATE PLOTTED:12/03/2020 2:30:56 PM BY: MAELLE BOURDAS
FILE K:\Projects\CW1055600_Perdaman_Chemicals_and_Fertilisers_Permits_and_approvals\5_Technical\Water and Environment\Comps_Drawings_File_Notes\arcGIS\Build\CW1055600_EN_002_DevelopmentEnvelope 04-2.mxd

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno

Date
12/03/2020

Size
A4

Scale
1:18,000

0 125 250 375 500m

DEVELOPMENT ENVELOPE AND INDICATIVE INFRASTRUCTURE

PERDAMAN UREA PROJECT

FIGURE 2

CW1055600_EN_002_DEVELOPMENTENVELOPE 04-2

Appendix 2: EPBC listed threatened and/or migratory marine species

Species	Common name	Threatened	Migratory
Shorebirds			
Calidris canutus	Red Knot	Endangered	y
Calidris ferruginea	Curlew sandpiper	Critically endangered	y
Calidris tenuirostris	Great knot	Critically endangered	y
Charadrius leschenaultii	Greater sand plover	Vulnerable	y
Charadrius mongolus	Lesser sand plover	Endangered	y
Limosa lapponica	Bar-tailed godwit		y
Limosa lapponica baueri		Vulnerable	
Limosa lapponica menzbieri		Critically endangered	
Numenius madagascariensis	Eastern curlew	Critically endangered	y
Rostratula australis	Australian painted snipe	Endangered	
Actitis hypoleucos	Common sandpiper		y
Arenaria interpres	Ruddy turnstone		y
Calidris acuminata	Sharp-tailed sandpiper		y
Calidris alba	Sanderling		y
Calidris melanotos	Pectoral sandpiper		y
Calidris ruficollis	Red-necked stint		y
Calidris subminuta	Long-toed stint		Y
Charadrius veredus	Oriental plover		y
Glareola maldivarum	Oriental pranticole		y
Limicola falcinellus	Broad-billed sanpiper		y
Limosa limosa	Black-tailed godwit		y

Species	Common name	Threatened	Migratory
Numenius phaeopus	Whimbrel		Y
Phalaropus lobatus	Red-necked phalarope		y
Pluvialis fulva	Pacific golden plover		y
Pluvialis squatarola	Grey plover		y
Tringa brevipes	Grey-tailed tattler		Y
Tringa nebularia	Common greenshank		y
Tringa stagnatilis	Marsh sandpiper		y
Tringa totanus	Common redshank		y
Xenus cinereus	Terek sandpiper		y
Seabirds			
Sternula nereis nereis	Australian fairy tern	Vulnerable	
Macronectes giganteus	Southern giant petrel	Endangered	y
Anous stolidus	Common noddy		y
Ardenna pacifica	Wedge-tailed shearwater		y
Calonectris leucomelas	Streaked shearwater		y
Fregata ariel	Lesser frigatebird		y
Hydroprogne caspia	Caspian tern		y
Sterna dougallii	Roseate tern		y
Other birds			
Apus pacificus	Fork-tailed swift		y
Pandion haliaetus	Osprey		y
Marine mammals			
Balaenoptera musculus	Blue whale	Endangered	y
Megaptera novaeangliae	Humpback whale	Vulnerable	y

Species	Common name	Threatened	Migratory
Balaenoptera edeni	Bryde's whale		y
Orcinus orca	Orca		y
Sousa chinensis	Indo-Pacific humpback dolphin		y
Tursiops aduncus	Spotted bottlenose dolphin		
Dugong dugon	Dugong		y
Marine reptiles			
Aipysurus apraefrontalis	Short-nosed seasnake	Critically endangered	
Caretta caretta	Loggerhead turtle	Endangered	y
Chelonia mydas	Green turtle	Vulnerable	y
Dermochelys coriacea	Leatherback turtle	Vulnerable	y
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	y
Natator depressus	Flatback turtle	Vulnerable	y
Sharks and rays			
Carcharias taurus	Grey nurse shark	Vulnerable	
Carcharodon carcharias	White shark	Vulnerable	y
Pristis clavata	Dwarf sawfish	Vulnerable	y
Pristis zijsron	Green sawfish	Vulnerable	y
Anoxypristis cuspidata	Narrow sawfish		y
Rhincodon typus	Whale shark	Vulnerable	y
Manta alfredi	Reef manta ray		y
Manta birostris	Giant manta ray		y

Attachment B - Pre- & Post-Wet Season Biological Survey

June
2019

PERDAMAN UREA PROJECT
Pre and Post-wet Season Biological Survey

Burrup Peninsula, WA

Prepared on behalf of Cardno by:

Animal Plant Mineral Pty Ltd

Burrup Peninsula:

Site F: TR 70/5461

Site C: TR 70/6697

Completed by: Animal Plant Mineral Pty Ltd

ABN: 86 886 455 949

Tel: (08) 6296 5155

Fax: (08) 6296 5199

Address : 47 Caroline Retreat

Henley Brook, Western Australia 6055

Website: www.animalplantmineral.com.au

For further information on this report please contact:

Dr Mitchell Ladyman

Tel: 0437 307 008

Email: mitch@animalplantmineral.com.au

Disclaimer

In the preparation of this document, Animal Plant Mineral Pty Ltd (APM) has relied on data, plans and other information provided by Cardno. Except as otherwise stated in the Report, APM has not verified the accuracy or completeness of the information. APM will not be liable in relation to incorrect conclusions or recommendations should any data or information, be incorrect, misrepresented or otherwise not fully disclosed to APM. Within the limitations imposed by the commission, the assessment of the site and preparation of the report have been undertaken in accordance with generally accepted practices using a degree of care ordinarily exercised by professional Resource and Environmental Consultants. No other warranty expressed or implied is made.

PERDAMAN INDUSTRIES
CHEMICALS & FERTILISERS

FOREWORD

CLARIFICATION OF PROJECT AREA

Some technical reports, including this one, were completed in the early planning and design phases of the Project. As such, some of the maps and aerial views depict the following anomalies associated with the actual Project area:

i. The Project boundary of Site F does not have an extension from the south west corner.

ii. The southern alignment of Hearson Cove Road is not applicable. Only the alignment on the north side of Site F will apply to the Project.

iii. The footprint of the port area is limited to the area depicting the *Storage Shed – Port* and *Shiploader – Feed Conveyor.* It does not extend out along the Bulk Liquids Berth Jetty.

Figures A and B below provide further clarification of these discrepancies.

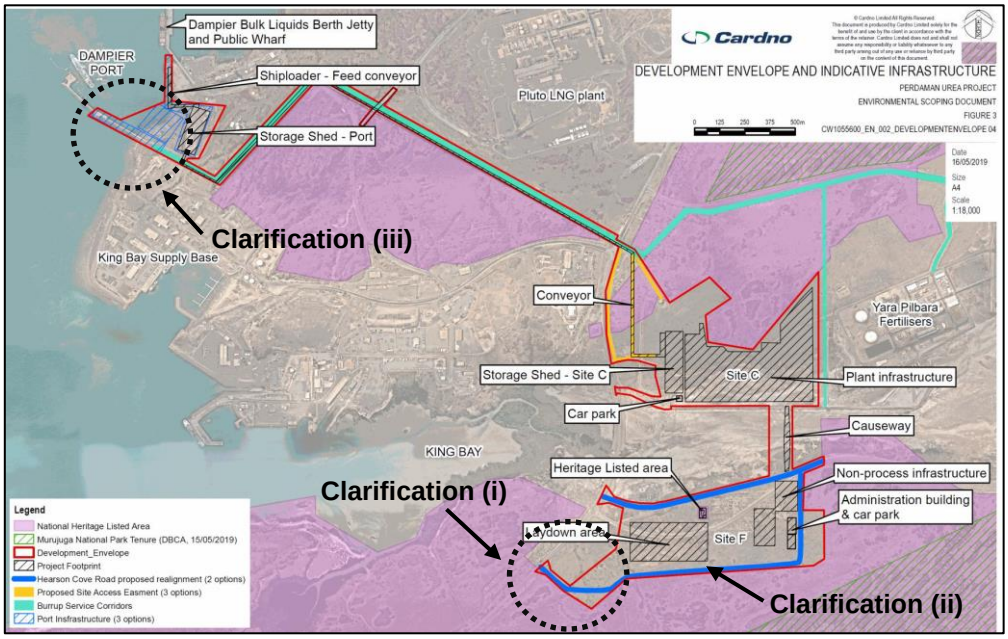


Figure A: Incorrect / superseded Project Area.

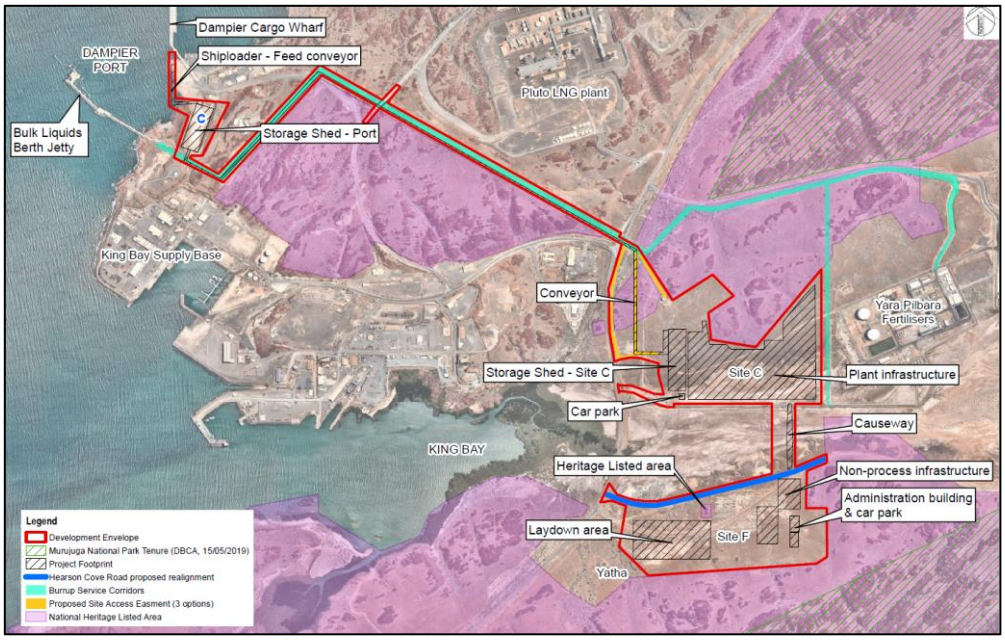


Figure B: Correct Project Area.

EXECUTIVE SUMMARY

The Perdaman Urea Plant Project (the **Project**) is located within the Burrup Strategic Industrial Area, on the Burrup Peninsula, approximately 13 km northwest of Karratha and 1,300 km north of Perth (Figure ES 1). The Burrup Peninsula is a narrow strip of land extending approximately 22 km from the mainland and is part of the Dampier Archipelago, a group of 42 islands and islets. Large outcrops and ranges of fractured red / brown rock and spinifex-covered scree slopes dominate the landscape of the Burrup Peninsula. The land is elevated from the typically low and flat coastal plains of the West Pilbara. Numerous gorges, creeks and drainage lines cutting across the landscape provide heterogeneity in the topography and the vegetation communities it supports. The landscape is distinctive in its appearance and is restricted to the Burrup Peninsula, some nearby islands and adjacent mainland (Department of Environment and Conservation, 2013).

To inform an environmental review document for the Project, Animal Plant Mineral was engaged to undertake:

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

The Project Area and Biological Study Area is shown in Figure ES 1.

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 adequate post-wet season survey conditions.

26 rocky outcrops were identified that constitute the P1 Priority Ecological Community – Rockpiles of the Burrup Peninsula. These locations are not presently listed on the Department of Biodiversity, Conservation and Attractions database. Seven vegetation associations have been classified in this assessment to be synonymous with vegetation associations listed by M.E. Trudgen & Associates (2002) as being of conservation significance because they have less than 10 occurrences across the Burrup Peninsula and Angel, Gidley and Dolphin Islands. Two flora species of conservation significance were identified inside the Project Area. *Terminalia supranitifolia* (P3) trees occur on rockpiles in the southern extent of the Project Area which are also classified as the P1 PEC - Rockpiles of the Burrup Peninsula. *Rhynchosia bungarensis* (P4) was collected in the eastern Project Area boundary in a shallow drainage area.

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 (*C. ruficapillus*), Grey-tailed Tattler (*T. brevipes*), and the Common Greenshank (*T. 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 vehicle access 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 should be avoided where possible.

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 should therefore be minimised.

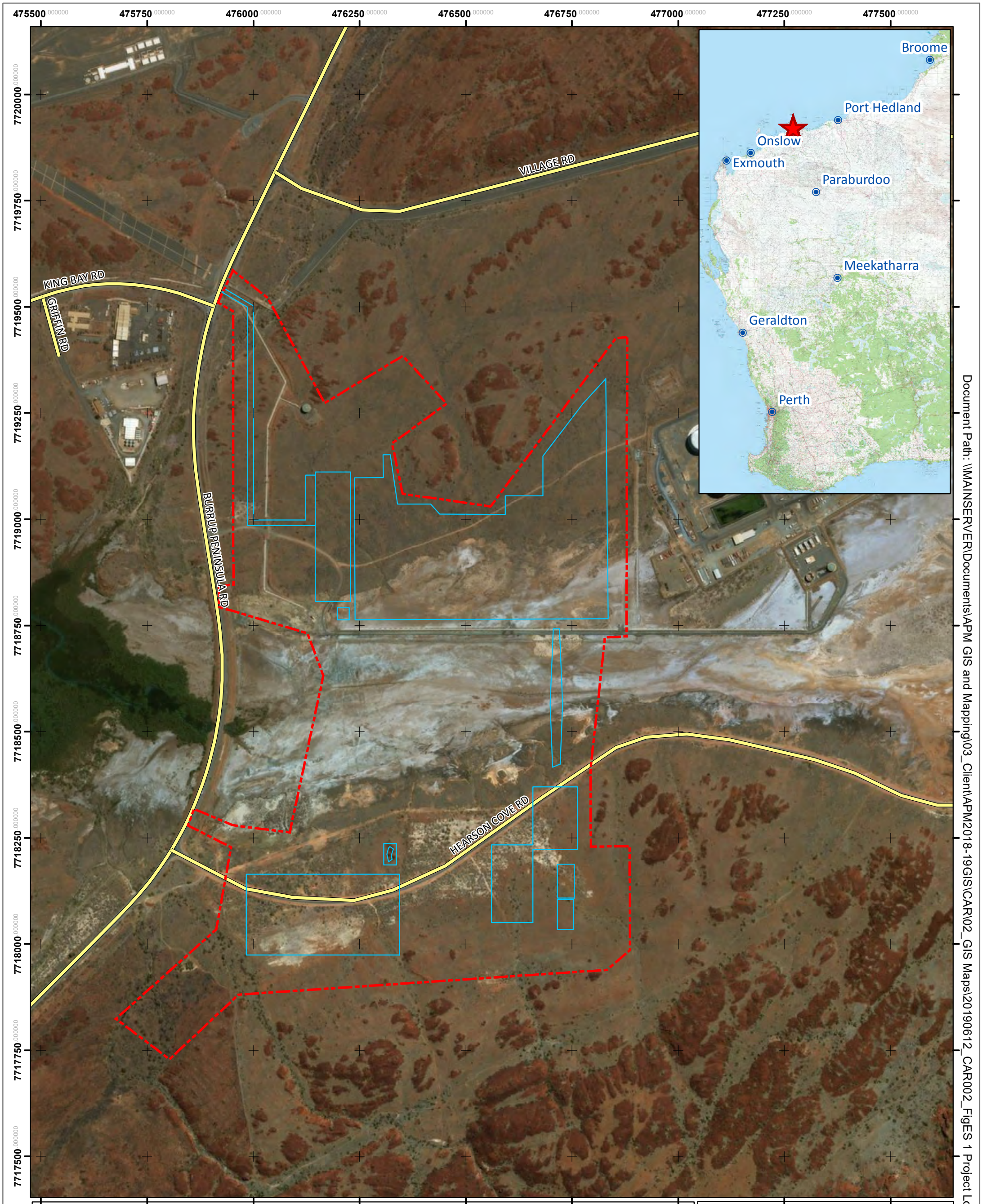


Figure ES 1: Study Location

Legend

- *Study Area*
- *Proposed Project Footprint*
- Main Roads WA

N

175 87.5 0 175 Meters

1 centimeter = 80 meters

Date: 12/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

CONTENTS

1 INTRODUCTION 9

1.1 Project and Location 9

1.2 Scope of Work 11

2 BACKGROUND AND SUPPORTING INFORMATION 13

2.1 Relevant Legislation 13

2.2 Standards and Guidelines 14

2.3 Land Use 14

2.4 Climate 15

2.5 Biogeographic Regionalisation 17

3 METHODOLOGY 25

3.1 Contributing Authors 25

3.2 Constraints 25

3.3 Database Searches 26

3.4 Flora and Vegetation Field Survey 28

3.5 Terrestrial Vertebrate Fauna 32

4 FLORA AND VEGETATION RESULTS 36

4.1 Desktop Survey 36

4.2 Field Survey 51

5 TERRESTRIAL VERTEBRATE FAUNA RESULTS 71

5.1 Desktop Survey 71

5.2 Field Survey 80

6 CONCLUSION 97

6.1 Vegetation of Conservation Significance in the Study Area 97

6.2 Flora of Conservation Significance in the Study Area 97

6.3 Impacts on Flora and Vegetation 97

6.4 Impacts on Fauna of Conservation Significance 99

REFERENCES 101

APPENDICES 105

APPENDICES

Appendix A: Department of Biodiversity Conservation and Attractions Protected Biota Categories .....

Appendix B: Database (2018) and Historical Survey Terrestrial Fauna and Flora Records .....

Appendix C: Protected Matters Search Tool EPBC Database Records (100 km & 5 km Buffers) .....

Appendix D: Department of Biodiversity Conservation and Attractions Database Search Results for Threatened and Priority Flora, Ecological Communities and Fauna .....

Appendix E: Atlas of Living Australia 10 km Buffer Database Search Results .....

Appendix F: NatureMap Database Search (10 km Buffer) .....

Appendix G: Survey Site Details.....

Appendix H: Conservation Significant Fauna (Terrestrial) Recorded within Database Searches and During Field Survey(s) .....

Appendix I: Species by Site Matrix.....

Appendix J: Bat Call Identification from the Burrup Peninsula (Specialised Zoological) (2018-2019).....

Appendix K: Bird Census (APM, 2018-2019) Results .....

Appendix L: Species Accumulation Curve Memorandum .....

FIGURES

Figure 1-1: Regional Location of the Burrup Peninsula and Study Area 10

Figure 2-1: Median monthly rainfall and the total monthly rainfall for 2018/19 recorded at Karratha Aero (BoM Station 004083). 16

Figure 2-2: Land Systems of the Study Area..... 19

Figure 3-1: APM Multi-Season Detailed Flora Survey Sites 29

Figure 4-1: Conservation Significant Communities Identified by Department of Biodiversity Conservation and Attractions Database Search as Occurring within the Study Area 40

Figure 4-2: Conservation Significant Flora Identified by Department of Biodiversity Conservation and Attractions Database Search as Occurring in the Vicinity of the Study Area..... 45

Figure 4-3: Cluster Analysis of the APM Vegetation Communities of the Study Area..... 52

Figure 4-4: Detailed Survey sites grouped by Cluster analysis 54

Figure 4-5: APM Vegetation Communities of the Study Area – North 57

Figure 4-6: APM Vegetation Communities of the Study Area – South 58

Figure 4-7: APM Conservation Significant Flora and Vegetation Communities of the Study Area 66

Figure 4-8: Vegetation Condition in the Study Area..... 68

Figure 5-1: Conservation Significant Fauna Identified by Department of Biodiversity Conservation and Attractions Database Search as Occurring in Vicinity of the Study Area 77

Figure 5-2: Fauna Habitats and Fauna Data Collection Points..... 88

TABLES

Table 2-1: Existing Flora and Fauna Surveys and Investigations within the Burrup Peninsula and Surrounds Relevant to the Project..... 21

Table 3-1: Constraints and the impacts on survey outcomes..... 25

Table 3-2: Database Searches Conducted Prior to Field Survey..... 27

Table 3-3: Parameters recorded at each Survey location..... 30

Table 3-4: EPA (2016a) Vegetation Condition Scale 31

Table 3-5. The location and details of each trap site used in the March/April survey. 33

Table 3-6: Camera trap and bat detector survey effort across all surveys..... 34

Table 4-1: Vegetation Communities from the Project Area that are Considered Significant using M. E. Trudgen & Associates (2002) Significance Assessment Criteria..... 42

Table 4-2: Conservation Significant Flora identified from the Database Searches 46

Table 4-3: Flora Taxa of Special Interest as described by M. E. Trudgen & Associates (2002) 49

Table 4-4: Groups of sites determined from Cluster analysis and their landscape position 53

Table 4-5: APM Vegetation Associations and Abbreviations 55

Table 4-6: Vegetation Associations Recorded by APM at the Study Area Compared with those Mapped by Astron Environmental (2005) and M. E. Trudgen & Associates (2002). 62

Table 4-7: Vegetation Associations that Occur in the Study Area that May Have Local Conservation Significance according to the Classification System devised by M. E. Trudgen & Associates (2002) 67

Table 4-8: Flora of Conservation Significance Recorded within the Study Area 69

Table 5-1: Conservation Significant Fauna Identified in the Database Searches and/or Recorded by APM (2018, 2019) or Worley Astron (2006) 72

Table 5-2: Introduced Fauna Identified in the Database Searches and/or Recorded by Worley Astron (2006), and APM (2018, 2019) 79

Table 5-3: APM Avifauna Survey Records and Associated Habitat Types 81

Table 5-4: Records of Non-volant Mammal Species across Two APM surveys 84

Table 5-5: Nights which Bat Species were Recorded in each Habitat 84

Table 5-6. 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. 86

Table 5-7: Conservation Significant Fauna recorded by APM, Showing the Number of Bird Individuals observed and the Number of Nights each Bat Species was Recorded 93

PLATES

Plate 5-1: Rocky Outcrop Habitat Trapping Sites 89

Plate 5-2: Hummock Grasslands on Mid-slope Trapping Sites 90

Plate 5-3: Samphire Shrubland / Supra-tidal Flat Trapping Sites 91

Plate 5-4: Examples of Mangrove Vegetation Adjacent to the Study Area, and Supra-tidal Habitat Present within the Study Area 91

Plate 5-5: Drainage Line Habitat in the Southwest Corner of the Study Area 92

ABBREVIATIONS

Abbreviation	Meaning
APM	Animal Plant Mineral
BAM Act	Biosecurity and Agriculture Management Act 2007
BC Act	*Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
BSIA	Burrup Strategic Industrial Area
Cth	Commonwealth
DBCA	Department of Biodiversity Conservation and Attractions
DEC	Department of Environment and Conservation
DoEE	Department of the Environment and Energy
EPA	Environmental Protection Authority of Western Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
MNES	Matter of National Environmental Significance
PEC	Priority Ecological Communities
WA	Western Australia

1 INTRODUCTION

1.1 PROJECT AND LOCATION

The Perdaman Urea Plant Project (the **Project**) is located within the Burrup Strategic Industrial Area (**BSIA**), on the Burrup Peninsula, approximately 13 km northwest of Karratha and 1,300 km north of Perth (Figure 1-1). The Burrup Peninsula is a narrow strip of land extending approximately 22 km from the mainland and is part of the Dampier Archipelago, a group of 42 inshore islands. Large outcrops and ranges of fractured red / brown rock and spinifex-covered scree slopes dominate the landscape of the Burrup Peninsula. The land is elevated from the typically low and flat coastal plains of the West Pilbara. Numerous gorges, creeks and drainage lines cutting across the landscape provide heterogeneity in the topography and the vegetation communities it supports. The landscape is distinctive in its appearance and is restricted to the Burrup Peninsula, some nearby islands and the adjacent mainland (Department of Environment and Conservation (**DEC**), 2013).

The Project Area is defined here as the proposed disturbance envelope, where land is to be cleared to allow the construction and operation of infrastructure. The Biological Study Area is a larger area that encompasses the Project Area. Small changes were made to the Study area between the pre- and post-wet season field surveys as the layout of the Project Area evolved to minimise impact to sensitive environmental areas. The Project Area is shown in Figure 1-1.

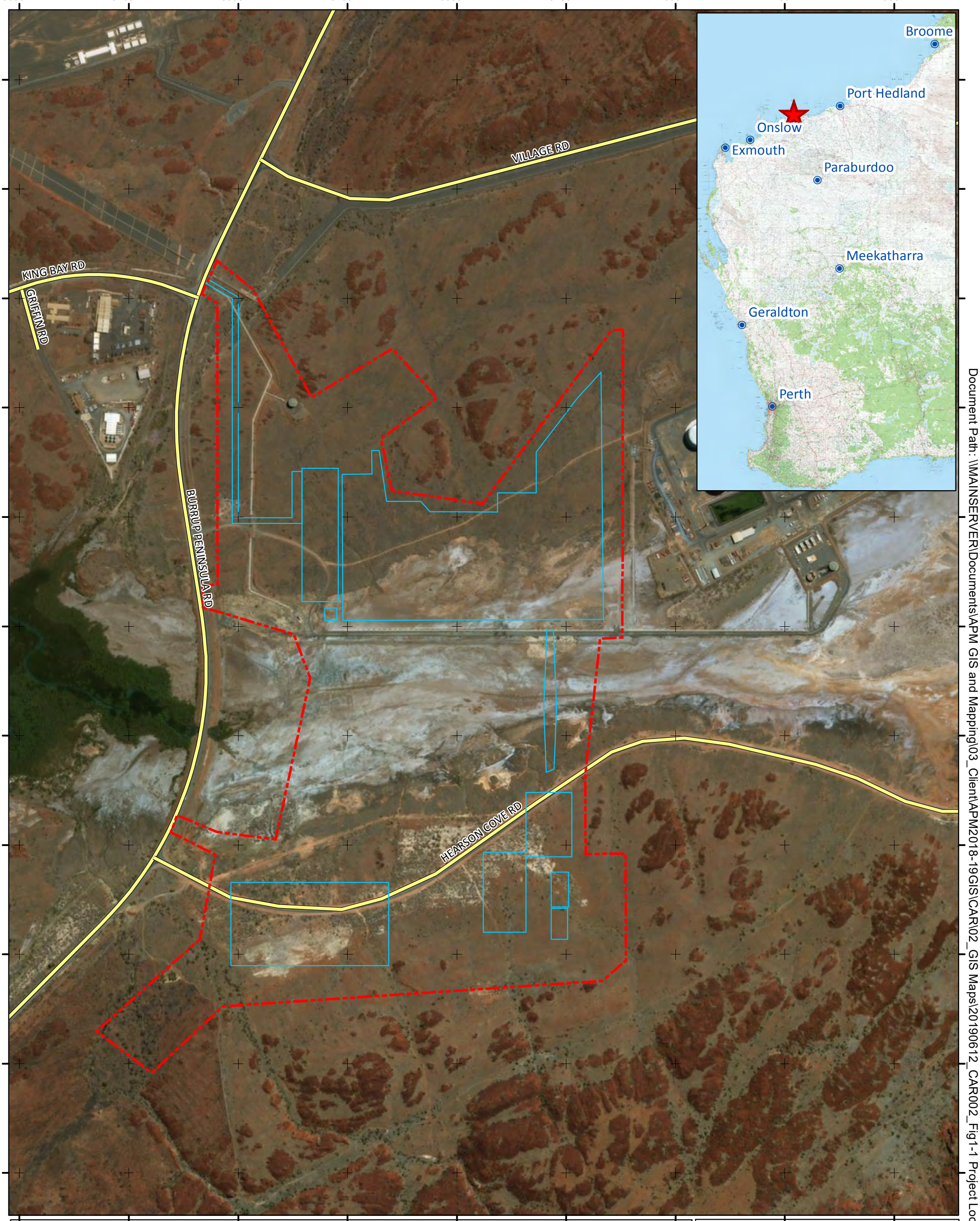


Figure 1-1: Study Location

Legend

- *Study Area*
- *Proposed Project Footprint*
- Main Roads WA

N

175 87.5 0 175 Meters

1 centimeter = 80 meters

Date: 12/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

1.2 SCOPE OF WORK

To inform an environmental review document for the Project, Animal Plant Mineral (**APM**) was engaged to undertake:

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

1.2.1 Flora and Vegetation

The aims of the desktop survey were to:

- Establish vegetation associations previously determined for the site and the region in order that field results can be compared for assessment;
- Identify species previously determined as present on site including Declared Rare and Priority Flora (under the provisions of the *Biodiversity Conservation Act 2016* (**BC Act**) and *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**));
- Identify species previously determined as present on site regarded as being "significant" at both local and regional scales;
- Identify vegetation types previously determined as present on site regarded as being "significant" at both local and regional scales;
- Identify weed species previously determined as present on site in particular any Declared Weeds;
- Identify and describe areas previously determined as present on site that are designated as conservation areas based on flora and vegetation significance;
- Identify potentially suitable habitat for conservation significant flora known from the region; and
- Identify suitable field survey timing and methodology.

The aims of the field survey were to:

- Determine vegetation associations on the site;
- Identify species present on site including Declared Rare and Priority Flora (under the provisions of the BC Act and EPBC Act);
- Identify species present on site that are regarded as being "significant" at both local and regional scales;
- Identify vegetation types present on site that are regarded as being "significant" at both local and regional scales;
- Locate and identify, as far as possible, weed species, in particular any Declared Weeds;
- Map the vegetation and sensitive species; and
- Identify and describe areas within the Study Area that are designated as conservation areas based on flora and vegetation significance.

1.2.2 Terrestrial Fauna

The aims of the desktop survey were to:

- Establish the faunal assemblage previously determined for the site and the region;
- Identify species previously determined as present on site including Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act);
- Identify species previously determined as present on site regarded as being "significant" at both local and regional scales;
- Identify habitat types previously determined as present on site regarded as being "significant" at both local and regional scales; and
- Identify introduced species previously determined as present on site.

The aims of the field survey were to:

- Survey the species assemblage present at the site;
- Identify the fauna habitat values present at the site;
- Identify habitat that may be suitable for Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act);
- Assess the likelihood of occurrence of Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act);
- Assess the likelihood of occurrence of species that are regarded as being "significant" at both local and regional scales; and
- Assess the habitat suitability and likelihood of occurrence of introduced species.

2 BACKGROUND AND SUPPORTING INFORMATION

2.1 RELEVANT LEGISLATION

2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

Matters of National Environmental Significance (**MNES**) are protected under the EPBC Act. Under this Act, activities that may have a significant impact on MNES must be referred to the Department of the Environment and Energy (**DoEE**) for assessment. The MNES include:

- Listed threatened species and communities
- Listed migratory species
- Ramsar wetlands of international importance
- Commonwealth marine environment
- World heritage properties
- National heritage places
- Great Barrier Reef Marine Park
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Migratory birds are further protected under the following agreements:

- 1974 Japan and Australian Migratory Bird Agreement (**Commonwealth**);
- 1975 Ramsar Convention on Wetlands;
- 1983 Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
- 1986 China and Australian Migratory Bird Agreement (Cth);
- 2004 Agreement on the Conservation of Albatrosses and Petrels;
- 2007 Republic of Korea-Australian Migratory Bird Agreement; and
- 2006 East Asian – Australasian Flyway Partnership.

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as MNES under the EPBC Act.

2.1.2 Western Australian Legislation

On 1 January 2019, the BC Act and *Biodiversity Conservation Regulations 2018* replaced both the *Wildlife Conservation Act* 1950 and the *Sandalwood Act* 1929 and their associated regulations. The BC Act and *Biodiversity Conservation Regulations 2018* provide protection for biodiversity through the Listing of native species, ecological communities, threatening processes and critical habitat, administration of the Licensing scheme and the protection and management of fauna.

The Department of Biodiversity Conservation and Attractions (**DBCA**) classifies specially protected flora and fauna into eight categories as listed in Appendix A. These categories also include potentially threatened species that do not meet survey criteria or are otherwise data deficient; such species are listed as Priority 1, 2 or 3. While species that are adequately known, are rare but not threatened, are listed as Priority 4.

The *Biosecurity and Agriculture Management Act 2007* (**BAM Act**) and the *Biosecurity and Agriculture Management Regulations 2013* designate which weeds are Declared as Prohibited or requiring Control Actions in WA.

2.2 STANDARDS AND GUIDELINES

The following guidelines were used to define the objectives and methodology of the Biological Survey:

- *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessments* (Environmental Protection Authority of Western Australia (**EPA**), 2016a);
- *Environmental Factor Guideline: Flora and Vegetation* (EPA, 2016b);
- *Technical Guidance: Terrestrial Fauna Surveys* (EPA, 2016c)
- *Technical Guidance: Sampling methods for terrestrial vertebrate fauna* (EPA, 2016d); and
- *Environmental Factor Guideline: Terrestrial Fauna* (EPA, 2016e).
- *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE, 2017)

2.3 LAND USE

The BSIA is a well-established industrial estate with vacant land for strategic industry in close proximity to gas, port and other key infrastructure facilities in the Pilbara region. The BSIA is located within the City of Karratha. Under the City's Town Planning Scheme No.8, the BSIA is zoned 'Strategic Industry'.

The Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) was commissioned by the Burrup Peninsula Management Advisory Board for the purpose of allocating land for industry, conservation, heritage and recreation. This document also provides management objectives and outlines acceptable uses and development considerations. The plan was endorsed by Cabinet in 1996.

The BSIA has been created to take advantage of the region's natural gas resources and other competitive advantages. Industries currently located within the BSIA include:

- Woodside-operated North West Shelf Venture project – a joint venture between Woodside, Shell, BHP Billiton, BP, Chevron and Japan Australia LNG;
- Woodside Pluto LNG plant;
- Yara Pilbara Fertilisers plant; and
- Yara Pilbara Nitrates technical ammonium nitrates plant.

The Department of Jobs, Tourism, Science and Innovation is the lead agency for the development of the BSIA and LandCorp is the estate manager.

The Project Area is on land parcels C and F of the BSIA and will also require an 'amalgamated C and F' zone between the two lots. Parts of Site F and the 'amalgamated C and F' zone have previously been disturbed for a construction camp and are rehabilitated.

The Project Area has previously been investigated for two projects that did not go ahead.

Site C was investigated for the proposed Ammonia-Urea Plant by Dampier Nitrogen Pty Ltd (EPA, 2002). The EPA ruled that the project was capable of being managed in an environmentally acceptable manner given the proponents commitments. The commitments relevant to this study were to minimise clearing of conservation significant flora and vegetation and conservation significant fauna habitat.

Site F was investigated for the proposed Gas to Synthetic Hydrocarbons Plant by Syntroleum Sweetwater LLC (EPA, 2000). The Minister ruled that the project was capable of being managed in an environmentally acceptable manner given specific conditions and procedures were adhered to. The conditions and procedures relevant to this study required:

- 100 % replacement of any destroyed Priority flora;
- Collection of native seed of Priority and other native plant species;
- Machine hygiene for weed control;
- A rehabilitation plan including a weed management plan and topsoil management plan;
- Ongoing floristic survey to ensure 100% of the floristic diversity was understood;
- The use of clearing techniques that minimise harm to soil structure;
- Minimisation of impacts to the drainage features in the west of the Project Area;
- Field survey of 30 to 40 ha for snails in the rocky terrain to the south of the Project Area to quantify impacts on the biodiversity and abundance of molluscs;
- Further fauna survey to ensure 100% of the faunal diversity was understood; and
- Minimisation of impacts to flora and fauna during the construction and operation of the facility.

Particular consideration was given to the drainage features in the west of the Project Area.

2.4 CLIMATE

The Burrup Peninsula lies at the western edge of the semidesert tropical Pilbara region within Australia's arid zone. The climate is commonly described as having two seasons: warm and dry winters from May to November, and hot summers with periodic heavy rains from December to March.

The climate is monsoonal and seasonally controlled by the large high pressure cells that pass from west to east across the Australian continent. Strong easterly winds prevail in the winter due to the development and intensification of anticyclones over southern WA or South Australia. In summer prevailing winds are generally warmer and from the northwest and southwest.

Dampier Salt weather station (12 km to the south of the site, Station 005061) opened in 1969 and Karratha Airport weather station opened in 1971 (10 km to the south of the site, Station 004083) (Bureau of Meteorology (**BoM**), 2019). Rainfall data is available for the duration of opening for both stations. Recent temperature data is available only from Karratha Airport for the period 1993 to 2019.

For the period 1993 to 2019 the annual mean maximum recorded temperature at Karratha Airport is 32.4°C, with an annual mean minimum recorded of 20.8°C. Monthly mean maximum temperatures recorded range from

26.3°C in July to 36.2°C in March. Monthly minimum temperatures range from 13.8°C in July to 26.8°C in January (BoM, 2019).

Annual rainfall in the region is characterised by low, highly variable and very localised rain events due to thunderstorm and tropical cyclone activity in the summer months. Average annual rainfall recorded at Karratha Airport is 285.4 mm whereas median annual rainfall is 119.4 mm (BoM, 2019). Rainfall in the region is seasonal, usually with two peaks per year. The first peak is from January to March due to tropical cyclones, tropical lows or rain-bearing depressions and tropical thunderstorms. The second peak is from May to June due to the passage of low pressure systems through the south of Western Australia (**WA**). Monthly average rainfall for the area ranges between 75.4 mm in February to 0.4 mm in October. Due to tropical cyclones, the area is prone to isolated extreme rainfall events. The highest rainfall recorded in a single month was 348.8 mm in February 2011, while all calendar months have at one stage recorded 0 mm of rainfall (BoM, 2019). Median monthly rainfall and the total monthly rainfall for 2018 and 2019 is shown in Figure 2-1.

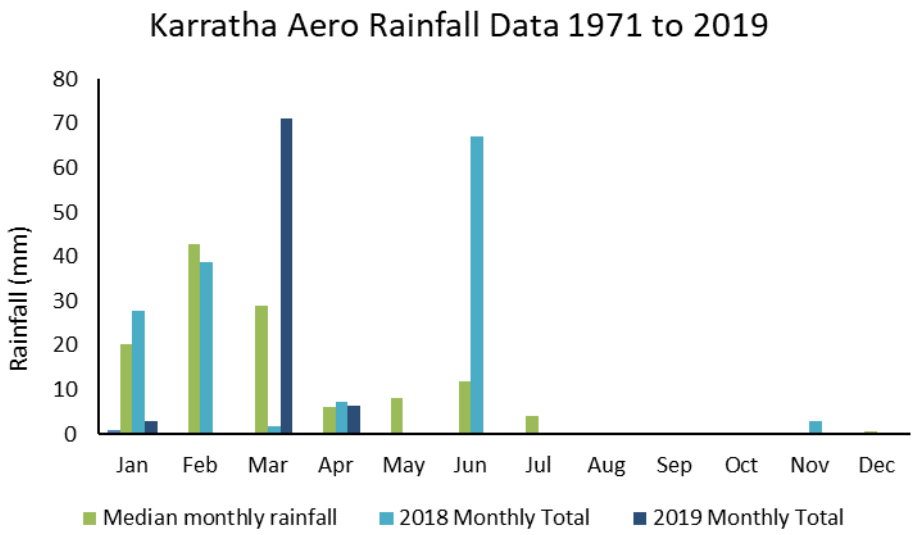


Figure 2-1: Median monthly rainfall and the total monthly rainfall for 2018/19 recorded at Karratha Aero (BoM Station 004083).

Rainfall for 2018 was below average for the period January to March yet was not dissimilar to the median values for those months. Rainfall for the period June to August was 126 % higher than average, with 67.2 mm falling between the 6th and 7th of June, but no rainfall in July and August. Rainfall in January and February 2019 was below median values but the rainfall associated with a tropical cyclone led to 71 mm of rainfall recorded at Karratha aero between the 18th and 27th of March.

Wind direction at the Burrup Peninsula is predominately from the east during the winter months of April, May, June, July and August with average wind speeds ranging between 17 – 24 km/h. East to southeasterly winds are dominant in the mornings, shifting to northeasterly in the afternoon and easing in the evening in response to diurnal land temperature changes. From October through to February winds are predominantly westerly in the morning, shifting to dominant northwesterly onshore winds in the afternoon with mean wind speeds varying between 19 and 30 km/h. The months of February, March and September are transition months with less dominant wind patterns, with mean wind speeds varying between 19 and 28 km/h. Extreme wind conditions may be generated in the region by tropical cyclones, strong easterly pressure gradients, squalls and tornados. Tropical cyclones generate the most significant storm conditions in the region, wind gusts of 259 km/h at Mardie

being measured during cyclone Trixie in February 1975, and Dampier recording wind gusts of 183 km/h from cyclone Orson in 1989 (BoM, 2019).

2.5 BIOGEOGRAPHIC REGIONALISATION

The Interim Biogeographic Regionalisation for Australia (version 7) represents a landscape-based approach to classifying the land surface of Australia. 89 biogeographic regions and 419 sub regions have been delineated, each reflecting a unifying set of major environmental influences which shape the occurrence of flora and fauna and their interaction with the physical environment across Australia.

The Burrup Peninsula is within the Pilbara biogeographic region, within the Roebourne subregion (Department of the Environment, 2012). The '*Bioregional Summary of the 2002 Biodiversity Audit for Western Australia*' (Mckenzie *et al*. 2003) describes the Roebourne subregion, as follows:

> *"Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of Acacia stellaticeps or A. pyrifolia and A. inaequilatera. Uplands are dominated by Triodia hummock grasslands. Ephemeral drainage lines support Eucalyptus victrix or Corymbia hamersleyana woodlands. Samphire, Sporobolus and mangal occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains, with minor exposures of granite. Islands are either Quaternary sand accumulations, or composed of basalt or limestone, or combinations of any of these three. Climate is arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer. Cyclonic activity is significant, with several systems affecting the coast and hinterland annually".*

The Burrup Peninsula lies within the Fortescue Botanical District, which is part of the biogeographical region known as the Eremaean Botanical Province (Beard, 1975).

The Burrup Peninsula, approximately 22 km long and 5 km wide, was originally an island that formed part of the Dampier Archipelago. It was joined to the mainland in the mid-1960s by a road causeway, forming the Burrup Peninsula. The Burrup Peninsula is bound by Mermaid Sound to the west and Nickol Bay to the east, and is distinguished by large areas of weather resistant rocky outcrops and scree slopes. These high scree slopes form part of an extensive high scree range which runs throughout most of the Burrup Peninsula, rises to 60 m above sea level in places, and serves as the main catchment for water during rainfall events.

Rocky outcrops exist in the northern and southern sections of the Project Area, with steeply inclined valleys occurring along fault lines forming minor drainage lines feeding into shallow drainage gullies through the mid to lower slopes of the site. These gullies then drain to the supra-tidal flats that run through the centre of the site before flowing in a westward direction to King Bay.

The topography of the Project Area is dominated by the supra-tidal flats that form an east-west trending valley at approximately 4 m Australian Height Datum from King Bay in the west to Hearson Cove in the east and divide the Burrup Peninsula into two separate units. The floor of this valley is composed of marine sediment.

The geology of the Burrup Peninsula has been previously investigated by the Geological Survey of WA and has been described by O'Brien Planning Consultants (1996). The Burrup Peninsula is composed mainly of an intrusive Proterozoic igneous rock outcrop known as the Gidley Granophyre, which is approximately 2,200 million years old. The main outcrop of Gidley Granophyre occurs in the Dampier Archipelago and the adjacent mainland, along basal unconformity of the Fortescue Group (Hickman, 1983).

The base of the intrusion consists of a differentiated coarse-grained gabbro and the main body is a fine-grained granophyre. The gabbro weathers to a dark brown and the granophyre to a lighter red-brown, and both rock

types are resistant to erosion and form aggregates of split boulder screes. Rapid weathering of dolerite dykes that are also present has resulted in the formation of deeply incised, narrow valleys, amongst the exposed granophyre bedrock, generally trending either southwest to northeast or east to west throughout the Burrup Peninsula.

The proposed Project site includes exposed granophyre bedrock, and colluvium of sand, silt and gravel in outwash fans of the supra-tidal flats that run through the middle of the Project Area and indicate a soil profile associated with a low energy marine depositional environment. The soil profile is largely comprised of sandy loams to silty sands generally brown to grey in colour. The sediments are typically organically rich and often contain a thin veneer of shelly lenses.

2.5.1 Land Systems

Two land systems as described by van Vreeswyk *et al*. (2004) are present at the Project Area: Granitic and Littoral. The Granitic land system is described by van Vreeswyk *et al*. (2004) as:

"Rugged granitic hills supporting shrubby hard and soft spinifex grasslands."

The Littoral land system is described by van Vreeswyk *et al*. (2004) as:

"Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches."

Granitic and Littoral land systems make up 2.2 % and 0.9 %, respectively, of the Pilbara Rangeland surveyed by Vreeswyk *et al*. (2004). TheGranitic land system is present at the northern and southern sections of the Project Area, while the Littoral land system is present across the central section (Figure 2-2).

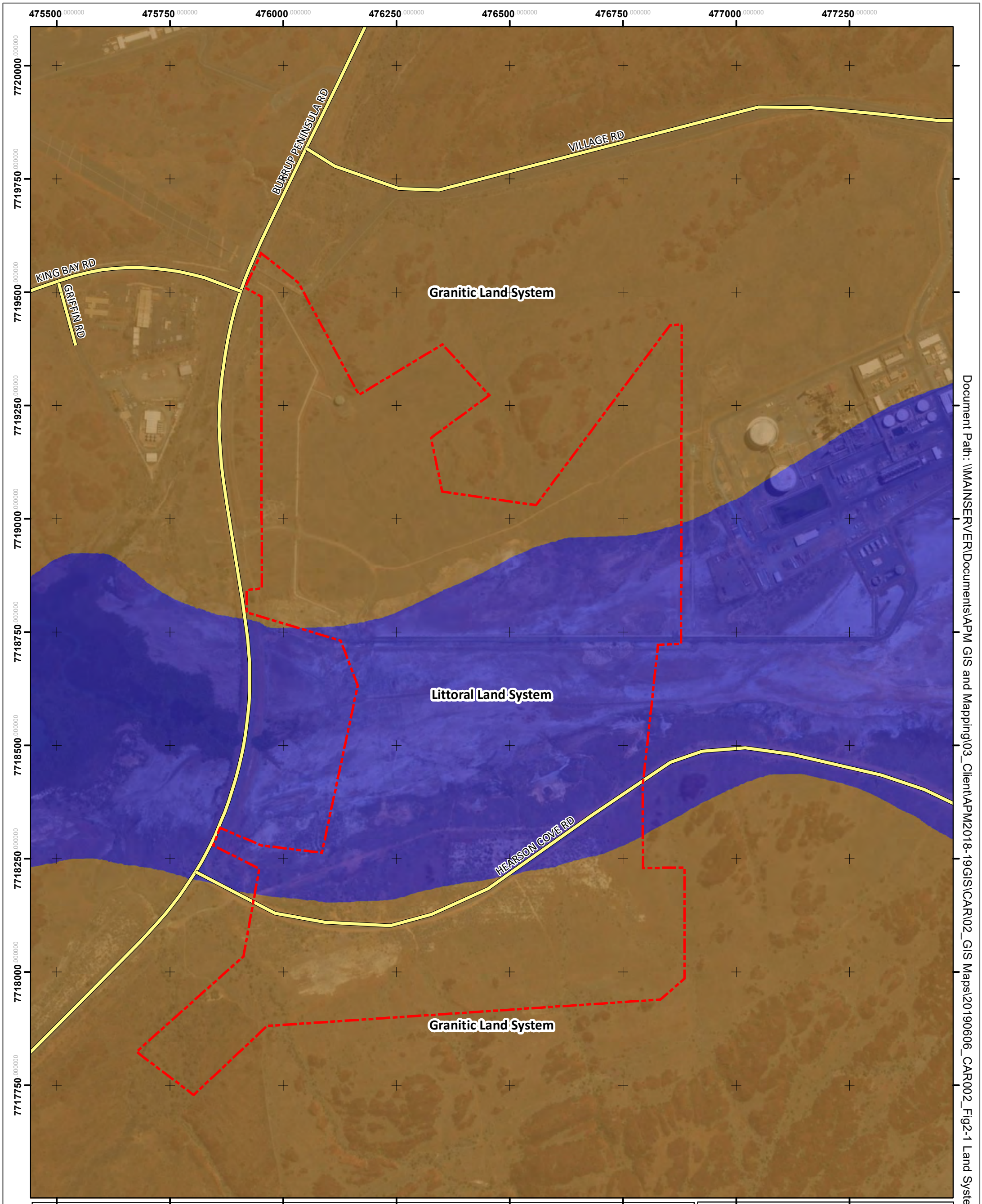


Figure 2-2: Land Systems of the Study Area

Legend

Study Area

Main Roads WA

Landsystems_Burrup

Granitic Land System

Littoral Land System

N

160 80 0 160 Meters

1 centimeter = 75 meters

Date: 6/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190606_CAR002_Fig2-1 Land System.mxd

Project Area soils are of Group 423 - Red shallow sands, Soil sub-group - Red shallow sands on granite, which are described in van Vreeswyk *et al*. (2004) as:

> *"These soils are uniform textured coarse sands or medium textured sands overlying weathered granite, sandstone or red-brown hardpan at shallow (25-50 cm) depth. Some soils occur over substrates such as conglomerate or quartz and are incorporated into this group. The soils are red to dark red in colour and non-calcareous with a weakly acidic to neutral soil reaction trend. The soils are mostly found within or adjacent to the parent rock resulting in gritty sands. The lower subsoil mostly overlies partially weathered granite rock and coarse fragments of quartz and granite are common throughout the profile. These soils often have a common to abundant (10>50%) stony mantle. Slightly saline soils may infrequently occur at the base of occasional large granite domes or outcrops. Domes and tors of bare rock are included in this soil group."*

2.5.2 Surface Water

No very small, small, medium or large water bodies occur in the Project Area (Department of Water and Environmental Regulation, 2018). Small ephemeral creeks drain water from the rocky outcrops in the north and south to the supra-tidal flats between King Bay and Hearson's Cove, in the centre of the Project Area.

2.5.3 Wetlands and Environmentally Sensitive Areas

The Project Area does not include and is not in close proximity to any wetlands listed as Ramsar sites (Department of Water and Environmental Regulation, 2018), nor does it occur within an Environmentally Sensitive Area. The Project Area is within an area zoned for Industrial Development on the Burrup Peninsula.

2.5.4 Previous Surveys

Many Private Industry Developments have commissioned independent studies on the Burrup Peninsula. Some of these are publicly available through the EPA assessment process. Table 2-1 lists previous assessments that overlapped, or were in close proximity to, the Project Area.

Table 2-1: Existing Flora and Fauna Surveys and Investigations within the Burrup Peninsula and Surrounds Relevant to the Project

Report Title	Consultant	Year	Survey Type	Purpose
Flora and Vegetation				
Flora and Vegetation Survey of the Proposed Gas to Synthetic Hydrocarbons Plant	Astron Environmental	1999	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance.
Flora and Vegetation Survey of the Proposed Ammonia Plant	Astron Environmental	2001	Reconnaissance Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This site is adjacent to the Project Area and the survey area overlaps the project. Results of this survey are discussed in more detail in Section 4.1.3
A Flora, Vegetation and Floristic Survey of the Burrup Peninsula, some adjoining areas and part of the Dampier Archipelago, with comparisons to the floristics of areas on the adjoining mainland (Volume 2)	M. E. Trudgen & Associates	2001	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This study is the most comprehensive assessment of the regional significance of flora and vegetation. Results of this survey are discussed in more detail in Section 4.1.3
A Flora, Vegetation and Floristic Survey of the Burrup Peninsula, some adjoining areas and part of the Dampier Archipelago, with comparisons to the floristics of areas on the adjoining mainland (Volume 1)	M. E. Trudgen & Associates	2002	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This study is the most comprehensive assessment of the regional flora and vegetation. Results of this survey are discussed in more detail in Section 4.1.3
A detailed survey of the samphire vegetation in the Hearson's Cove/King Bay inlet on behalf of URS.	Astron Environmental	2002	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This study is the most comprehensive assessment of the supratidal inlet flora and vegetation. Results of this survey are discussed in more detail in Section 4.1.3
King Bay Eastern Lease Area Industrial Estate Vegetation and Flora Report	Astron Environmental	2003	Reconnaissance Survey	To map vegetation types at a broad scale and identify any significant flora or vegetation and weed species present on site to assist relevant government bodies in achieving a low-level assessment. This study was reviewed.
Dampier Nitrogen Plant Site Wet Season Vegetation and Flora Survey Report as prepared for URS Consultants (Ref: 3909 2005-RV-01)	Astron Environmental	2005	Detailed Survey	To map the vegetation and supplement information presented in the Astron 1997 dry-season report by conducting a wet-season survey to identify all Priority and Threatened flora, weeds and Declared weeds.

Report Title	Consultant	Year	Survey Type	Purpose
Pluto LNG Development Vegetation and Flora Survey Site A	Astron Environmental	2005	Detailed Survey	To map the vegetation and compare previously mapped vegetation associations to be used in significance assessment. Identify Priority and Threatened flora, weeds and Declared weeds in order to designate areas of sensitivity and conservation. This study was reviewed.
Technical Ammonium Nitrate Production Facility. Public Environmental Review for Burrup Nitrates Pty Ltd	Environmental Resources Management Flora and Vegetation assessment by Outback Ecology (2009)	2009	Reconnaissance Survey	To provide a comprehensive desktop assessment of the area (Site D) for the Technical Ammonium Nitrate Production Facility including vegetation communities, the extent of the now Murujuga National Park, broad landscape and vegetation attributes and hydrology and drainage. This site is within the same catchment as the Project Area. Results of this survey are discussed in more detail in Section 4.1.3
Pluto LNG Development Site B North – Flora and Vegetation Assessment Survey	ENV Australia	2006	Detailed Survey	To identify all flora and vegetation associations occurring within Site B North in order to assess conservation significance. This study was reviewed.
Pluto LNG Development Proposed Gas Trunkline Option 1: Flora and Vegetation Condition Assessment	ENV Australia	2006	Targeted Survey	To search and assess presence or absence of Priority flora and undertake a vegetation condition assessment for the Pluto LNG Development Proposed Pipeline Route Terminating at Gas Trunkline Option 1 where vegetation is likely to be disturbed along the pipeline route. This study was reviewed.
Pre-Wet Season Biological Survey	APM	2018	Detailed Survey	To undertake a pre-wet season survey to assess vegetation associations of Sites C and F and the 'C and F amalgamation' zone through detailed sampling of flora to identify the types of species assemblages and vegetation communities that are present within the Project and to shape the survey efforts for the following season survey and adequately determine if significant flora or vegetation are likely to occur at the Project, given the distribution of habitats.
Fauna				
Fauna and Marine Biota. In: Burrup Peninsula Draft Land Use and Management Plan, Technical Appendices. Unpublished report by O'Brien Planning Consultants	H. Butler	1996		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Burrup Liquid Ammonia Plant targeted fauna survey. Unpublished report for Sinclair Knight Merz Pty Ltd	Biota Environmental Services	2001		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available

Report Title	Consultant	Year	Survey Type	Purpose
Terrestrial Fauna and Habitats. In: Methanex Australia Pty Ltd, Methanol Complex, Burrup Peninsula Western Australia, Public Environmental Review (Section 5.8)	Biota Environmental Services	2002		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Burrup Fertilisers Pty Ltd. Fauna of the Burrup Peninsula and the Proposed Ammonia Plant (Revised version). Unpublished report to Sinclair Knight Merz Pty Ltd	Astron Environmental	2001		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Natural Gas to Synthetic Oil Project Product and Feed pipelines, Vegetation, Flora and Fauna Survey. Unpublished report for Syntroleum Corporation	Astron Environmental	1999		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Terrestrial Fauna and Habitats. In: Burrup Peninsula Fertilisers Pty Ltd, Proposed 2,200 tpd Ammonia Plant, Burrup Peninsula Western Australia, Public Environmental Review (Section 5.8). August 2001. Prepared for Sinclair Knight Merz	Astron Environmental	1999		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Vegetation, Flora and Fauna Survey. In: Syntroleum, Proposed Gas to Synthetic Hydrocarbons Plant, Burrup Peninsula Western Australia, Consultative Environmental Review. November 1999. Prepared for HLA – Envirosciences Pty Ltd	Astron Environmental	2001		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Offshore Petroleum Pty Ltd	1995		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Offshore Petroleum Pty Ltd	1997		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Offshore Petroleum Pty Ltd	1998		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Energy Pty Ltd	1999		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Pluto LNG Development Survey of Non-marine Molluscs	S.M. Slack-Smith	2005	Targeted Survey	Cited in Worley Astron 2006 – A targeted assessment of the non-marine mollusc fauna of the Burrup Peninsula to allow assessment of the probable effect of the land based components associated with the Plutos LNG Development proposed by Woodside.
Fauna assessment surveys of the Pluto LNG Development pipeline corridors	ENV Australia	2006		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Pluto LNG Development Holden Beach Sea Turtle Habitat Use Survey	Pendoley Environmental	2006	Targeted Survey	To search for evidence of sea turtle nesting activity within the vicinity of a trunkline shore crossing location associated with the proposed Pluto LNG Development at Holden Beach

Report Title	Consultant	Year	Survey Type	Purpose
Terrestrial Fauna of the Burrup Peninsula, unpublished report prepared for BGC Contracting	Astron Environmental	2003	Desktop Survey	To provide a comprehensive desktop assessment of the King Bay Eastern Leases area and determine fauna of significance that may inhabit the lease of adjoining areas
Pluto LNG Development Desktop Fauna Report	Worley Astron	2006	Level 1 Desktop Survey	To provide a comprehensive desktop assessment of the Pluto LNG Development area and determine fauna of significance that will be required to be assessed for presence/absence in future targeted surveys.
Technical Ammonium Nitrate Production Facility. Public Environmental Review for Burrup Nitrates Pty Ltd	Environmental Resources Management	2009	Reconnaissance Survey	To provide a comprehensive desktop assessment of the area (Site D) for the Technical Ammonium Nitrate Production Facility including noise monitoring sites, noise contouring and reduction measures, the extent of the now Murujuga National Park, broad landscape and vegetation attributes and hydrology and drainage.

3 METHODOLOGY

3.1 CONTRIBUTING AUTHORS

The planning and design of this survey was conducted by APM Principal Zoologist Dr Mitch Ladyman, Senior Botanist Dr Eleanor Hoy, and Senior Zoologist Dr Stuart Dawson. Fieldwork was carried out by E. Hoy, S. Dawson, Senior Zoologist Dr Genevieve Hayes, Environmental Scientist Sarah Flemington, Senior Ornithologist Dr Floyd Holmes, and Graduate Environmental Scientist Arlen Hogan-West.

The report was drafted by S. Flemington, E. Hoy, S. Dawson, and M Ladyman, while Environmental Scientist Tony Smith conducted GIS analysis.

3.2 CONSTRAINTS

Constraints and their impacts on survey outcomes are discussed in Table 3-1.

Table 3-1: Constraints and the impacts on survey outcomes

Factor	Impact on survey outcomes
Access Problems	Most of the site was only accessible by foot. This was not a limiting factor, however, and all areas were adequately surveyed.
Experience levels	The personnel that executed these surveys included practitioners that are regarded as suitably qualified in their respective fields. • Dr Eleanor Hoy – Senior Botanist (10 years experience) • Dr Stuart Dawson – Senior Zoologist (5 years experience) • Dr Geneieve Hayes - Senior Zoologist (5 years experience) • Sarah Flemington – Environmental Scientist (2 years experience) • Dr Floyd Holmes – Senior Ornithologist (5 years experience) • Arlen Hogan-West – Graduate Environmental Scientist (1 years experience).
Scope: Flora	No constraints.
Scope: Vegetation	The survey was limited to the Study Area, excepting a small number of vegetation units in proximity to the Study Area that were included for statistical rigor of the analysis of vegetation types. Actual rather than predicted impact assessment of the proposed development may require verification of vegetation communities outside of the proposed development area.
Scope: Fauna	The scope of the fauna survey was a level 2 survey. In order to achieve the survey effort outlines in the guidelines for biodiversity surveys, trapping was conducted over 7 trap nights, and all methods of sampling were achieved within this time period. The spotlight surveys were targeted to sample the Northern Quoll and Pilbara Olive Python, two species that are cryptic and often in low densities. As a result of their cryptic nature, the absence of records does not necessarily indicate that these species are absent. In addition, the rocky outcrops where these species are likely to be present are relatively inaccessible with many rocky holes and caves for species to hide, making the probability of detection of these species limited. Two sites were placed in rocky outcrop habitat during the March/April survey, however due to the rocky nature of the substrate, no pitfall traps were used at these sites. To compensate, additional funnel traps were deployed.
Timing, weather, season, cycle	This biological report includes data gathered from field surveys conducted in November 2018 and March, April and May 2019. As such, surveys were conducted in a broad range of seasonal conditions. The 2019 wet season (Jan-March) experienced lower than average rainfall. This is likely to result in diversity and abundance of fauna and ephemeral flora being slightly lower than average years. While the survey timing did not include a period of spring tide, during which the tidal salt flats would be inundated, a cyclonic event just prior to fieldwork resulted in abundant

Factor	Impact on survey outcomes
	available water on the plains. This availability of water negates the limitation of the lack of spring tide.
Sources of information	The flora of the Burrup Peninsula is well studied. The regional work by M. E. Trudgen & Associates (2002) maps the current site and many flora and vegetation assessment surveys have been undertaken as part of the Environmental Impact Assessment process on development sites adjacent to the Project. Similarly, the fauna assemblage of the Burrup Peninsula is well studied, largely due to the number of different facilities that have been built on the peninsula in the last 30 years, and the resulting biological surveys. Many of these surveys are not freely available, however, while being referred to in more recent documents. The literature search is therefore deliberately limited to include surveys that include data directly comparable to our survey. Given the number of previous surveys and database searches, this is not considered a limitation.
Completeness: Flora and vegetation	The field survey recorded 86 taxa in November 2018 and an additional 42 taxa in May 2019 totalling 127 taxa (including species, subspecies and variants) from 34 Families. 390 taxa have been recorded for the Burrup Peninsula (Astron Environmental, 2005). Astron Environmental (2005) recorded 143 taxa from 44 families for an area greater than but including Site C and the 'Site C and F amalgamation' zone. Astron (2001a) recorded 131 species in the BFPL site immediately to the east of the Study Area.
Completeness: Fauna	305 vertebrate fauna taxa have either been recorded or are expected to occur in the Burrup Peninsula (Worley Astron, 2006). The level 2 biological survey conducted in early 2019, coupled with the level survey conducted in late 2018, represents an appropriate survey effort to provide a reasonable inventory of species occupying the site. Similarly, the bird survey was conducted in accordance with guidelines. The data gathered in this survey, coupled with previous surveys on the Burrup Peninsula, and appropriate database searches, provides an adequate understanding of the faunal assemblage at the site, such that completeness is not considered a limitation. Trapping could not be conducted in the floodplain during the March/April survey, due to the area being waterlogged from the recent rainfall. Given the area is completely devoid of cover, this area is unlikely to support many small animals.

3.3 DATABASE SEARCHES

Table 3-2 lists the database searches that were conducted prior to field survey. Some fauna studies have previously been undertaken in the surrounding area of the Burrup Peninsula and Dampier Archipelago. Relatively little fauna survey work, however, has been completed in the immediate proximity of or within the actual Project Area.

Table 3-2: Database Searches Conducted Prior to Field Survey

Database	Area Searched	Information	Administering Agency
Flora and Vegetation			
Australian Government Protected Matters Search Tool	Central co-ordinate within the Project Area with a 100 km buffer (Appendix C)	Matters of national significance and matters protected by EPBC Act	Department of Energy and Environment
Directory of Important Wetlands in Australia	Roebourne Biogeographic Subregion	Details of specific Ramsar and Directory Wetlands (Internationally and Nationally important wetlands, respectively)	
Threatened (Declared Rare) Flora Database	270 km of coastline plus the islands within 16 km, including the entire Burrup Peninsula (Appendix D)	Validated populations of declared rare flora and some priority flora	Department of Biodiversity Conservation and Attractions
Western Australian Herbarium Specimen Database		All records of declared Rare and Priority species from the Western Australian Herbarium collection of specimens, includes un-validated historical specimens	
Declared Rare and Priority Flora List		Declared Rare Flora and Priority Flora – provides a list of species and general distribution in an area of interest	
Priority Ecological Communities List		Priority Ecological Communities	
Fauna			
Australian Government Protected Matters Search Tool	Central co-ordinate within the Project Area with a 5 km buffer (Appendix C)	Matters of national significance and matters protected by *Environmental Protection and Biodiversity Conservation* (EPBC) *Act 1999*	Department of Energy and Environment
Atlas of Living Australia	Central co-ordinate within the Project Area with a 10 km buffer (Appendix E)	All species records that have been lodged with the database	Atlas of living Australia
NatureMap	Central co-ordinate within the Project Area with a 10 km buffer (Appendix F)	All species records that have been lodged with the database	Department of Biodiversity Conservation and Attractions (DBCA, WA)
Threatened Fauna Database	Area surrounding Project Area, including the entire Burrup Peninsula and islands within ~25 km (Appendix D)	Threatened and Priority Species listed under the *WC Act*	

3.4 FLORA AND VEGETATION FIELD SURVEY

3.4.1 Flora and Vegetation Survey Methodology

Vegetation classification is the process of identifying and characterising discrete vegetation units using empirical data. The aim of vegetation classification is to identify and describe the vegetation units present within a survey area, identify the local or regional significance of the identified units and provide sufficient information to enable analysis of impact significance. Two primary methods are used to classify vegetation units in WA: one is based on dominant species and vegetation structure and the other is based on analysis of floristic composition data.

A consistent approach to vegetation classification and description across surveys in similar regions is critical for the assessment of cumulative impacts at the local and regional scales. Differences in classification and analysis methods, consideration of scale, interpretation of floristic and structural vegetation information and terminology can lead to incompatibility between assessments. In identifying the appropriate methodology for the current survey, consideration was given to the methodology used in other local and regional assessments and adherence to the EPA (2016) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment*.

The fieldwork was conducted in two periods: a four-day survey was carried out by a Senior Botanist and assisting Environmental Scientist from the 19th to the 22nd of November 2018 and a 5-day survey from the 11th to 15th of May 2019 completed by a Senior Botanist. Flora surveys were undertaken in all the vegetation/soil types/landform units present in the study area, at representative locations established following the desktop assessments and initial site reconnaissance. Figure 3-1 shows the survey site locations and APM's vegetation assessment survey tracks .

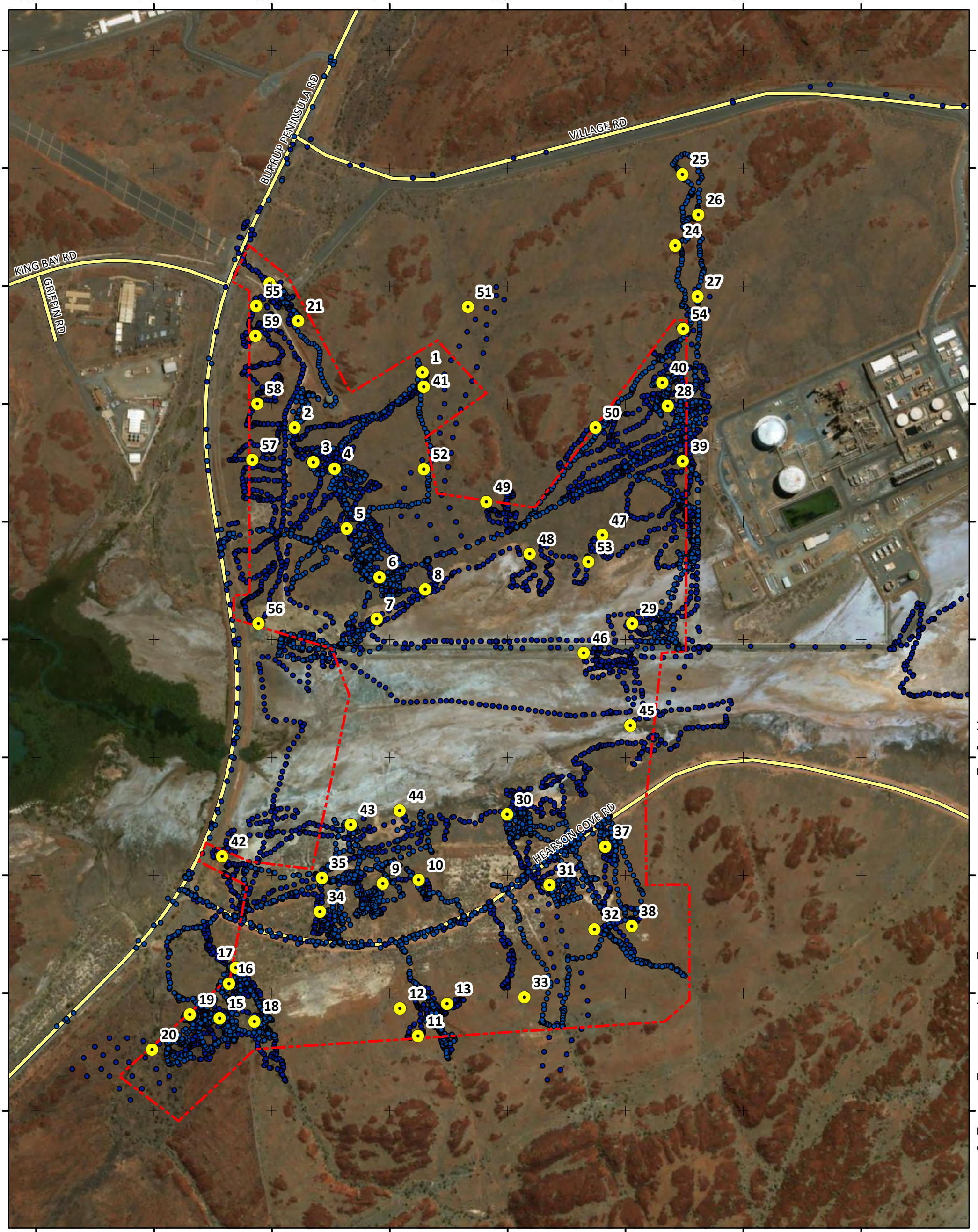


Figure 3-1: APM Multi-Season Detailed Flora Survey Sites

Legend

- *APM Survey Locations*
- *Track Logs for Flora and Vegetation Survey*
- *Study Area*
- Main Roads WA

N

160 80 0 160 Meters

1 centimeter = 75 meters

Date: 10/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190610_CAR002_Fig3-1 Flora and Vegetation Survey Locations.mxd

Vegetation was mapped at the association scale. Survey sites were allocated to identified vegetation types to accurately describe the vegetation association. Vegetation units were identified, and boundaries delineated using a combination of aerial photography, topographical features and field data/observations. Vegetation units were allocated mapping codes with reference to previously described vegetation types in the region (see section 4.1.2) based on structure, dominant taxa and cover characteristics. Field observations on the distribution of vegetation units were made using traverses, where notes on the location, dominant species and vegetation condition were taken to help with the extrapolation of vegetation type and condition.

Survey sites represent Full Characterisation Sites (EPA, 2016) and were sampled using quadrats of 50 m x 50 m where possible. In riparian areas or where the vegetation types were of an irregular distribution, quadrat dimensions were altered but the 2,500 m^2 search area was retained where possible. A number of vegetation units were substantially smaller than 2,500 m^2. These areas had clearly defined boundaries due to changes in vegetation composition, and the entirety of these vegetation units were sampled.

Field data at each survey site was recorded on a *pro-forma* data sheet and included the parameters detailed in Table 3-3. Details of survey sites are provided in Appendix G. A flora inventory was compiled from taxa listed in described survey sites and from opportunistic floristic collections throughout the survey area, with at least one collection made for every taxon encountered. 215 specimens were identified by an experienced botanical taxonomist in the Herbarium using published reference material. The nomenclature applied is consistent with Florabase (Western Australian Herbarium, 2019). The conservation status of all recorded flora was compared against the current lists available from DBCA (Wildlife Conservation (Rare Flora) Notice 2018 and Threatened and Priority Flora List 5 December 2018) and the EPBC Act List of Threatened Flora (DoEE, 2018a). Conservation categories are described in Appendix A.

Table 3-3: Parameters recorded at each Survey location

Variable	Parameters
Collection attributes	Personnel/recorder; date, quadrat dimensions and marking method, photographs of the quadrat from the northwest and south east corners, site code
Physical features	Landform, aspect, soil attributes, ground surface cover, rock type and physical attributes
Community Size	Width (m) if linear (e.g. riparian) or size (ha) if non-linear
Location	Coordinates recorded in GDA94 datum using a hand-held Global Positioning System (GPS) tool (Garmin) to accuracy approximately ± 5 m.
Vegetation condition	Vegetation condition was assessed using the condition rating scale devised by Trudgen (1988)
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, infrastructure works).
Flora	List of dominant flora from each structural layer. List of all species within the quadrat including average height and cover

Vegetation Condition was assigned using the scale developed for the Eremaean and Northern Botanical Provinces adapted from Trudgen (1988) as recommended in EPA (2016a). Table 3-4 details the six potential categories.

Table 3-4: EPA (2016a) Vegetation Condition Scale

Vegetation Condition	Eremaean and Northern Botanical Provinces adapted from Trudgen (1988)
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs

3.4.2 Flora and Vegetation Data Analyses

Floristic composition vegetation classification methodology was applied to the full suite of species present within quadrats, to determine whether the sites fall into clusters of similar communities. The Primer 7 (Clarke and Gorley, 2015) software was used to perform the non-parametric multivariate statistical analysis. A species by site matrix was prepared using species projected cover values and square root transformation applied. The square root transformation was selected to moderate the effect of the most dominant species without giving the singleton and sporadic species excessive weight. A resemblance matrix was constructed using the Bray Curtis similarity measure on the transformed data set. A cluster analysis was performed using group averages to identify sites with similarities in species composition and cover values, and the results displayed in a dendogram. The SIMPROF routine was used to test the hypothesis that the species and/or abundances are different at each group of sites using 999 permutations and a significance level of 5%.

The statistical methodology was selected to replicate that of Trudgen and Associates (2002).

Floristic composition vegetation classification methodology created high level groupings but did not adequately allow for comparison with previous surveys where data had not been statistically analysed by other biological survey practitioners. Structural vegetation classification was also retained to allow for comparison with previously described vegetation associations.

Structural vegetation classification uses vegetation structure and dominant species to describe differences between vegetation units. Structural vegetation classification provides information on height of strata, foliar cover and dominant species.

3.4.3 Priority Flora Targeted Searches

Targeted searches were conducted in all vegetation types with particular attention given around the rocky outcrops, drainage features and the fringes of the tidal inlet. Known locations of *Rhynchosia bungarensis* (P4) and *Stackhousia clementii* (P4) were searched and healthy plants identified so as to determine suitable conditions for searches of these species. Track logs of targeted searches are displayed in Figure 3-1.

Taxa with uncertain taxonomy (as identified in M.E. Trudgen & Associates, 2002) were systematically collected across the site for detailed determination at the herbarium.

3.5 TERRESTRIAL VERTEBRATE FAUNA

The terrestrial vertebrate fauna survey was conducted in two discrete periods, the initial, pre-wet season Level 1 survey, and the follow-up, post-wet season Level 2 survey.

The initial survey occurred between the 19th and 22nd of November 2018 and was conducted by Dr. S Dawson and Dr. F. Holmes. Fauna habitat was surveyed using nine survey points, distributed throughout the site and sampling the range of habitats present. At each survey point, a range of substrate, landform, vegetation, and structural parameters were measured. Any fauna sighted during recording at these points was recorded. Some areas adjacent to the Project Area that represented unique or significant habitat values were also surveyed. Morning and evening bird surveys were conducted, and camera traps and bat detectors were deployed in habitat appropriate for Threatened fauna. Spotlight surveys were also conducted each evening.

The post-wet season Level 2 survey was carried out between the 27th of March and the 5th of April 2019. This survey was conducted by Dr S. Dawson, Dr G. Hayes, Dr F. Holmes, S. Flemington and A. Hogan-West. This survey consisted of the deployment of six trap sites across the habitats available within the site, including cage traps, aluminium box traps, pitfall traps, funnel traps, camera traps, and acoustic bat recorders. In addition, morning and afternoon bird surveys and nocturnal spotlight surveys were conducted.

3.5.1 Trapping

During the post-wet season survey, conducted in March / April 2019, traps were deployed at six sites, two in each of the three major habitat types; rocky outcrop, mid-slope, and samphire. The flood plain in the centre of the site could not be sampled during trapping as it was waterlogged.

The trap effort and details of each site are shown in Table 3-5. Each trap site consisted of a single line of 5 drift fences (10 m), with one pitfall trap and a pair of funnels on each fence. Two lines of 10 aluminium box traps, one on each side, were set parallel to the line of fences, and cages were set on each end of both lines of box traps. In rocky outcrop habitat, pitfall traps were not used (as the substrate was too rocky to excavate), and an extra three pairs of funnels were deployed to compensate. Funnels and pit traps were checked twice daily, while cages and aluminium box traps were checked in the morning, closed throughout the day, then opened and re-baited in the evening. General marsupial bait (rolled oats, sardines, and peanut butter) was used.

Table 3-5. The location and details of each trap site used in the March/April survey.

Trap Site	Habitat	Easting	Northing	Cage	Aluminium Box	Funnel	Pit	Trap nights	Description
C01	Mid-Slope	0476587	7718117	4	20	10	5	7	Rocky substrate with scattered trees and tall shrubs over hummock grasses (25% ground cover). Creek line runs through the site.
C02	Rocky Outcrop	0476383	7717975	4	20	16	0	7	Rocky slope with scattered tall shrubs over hummock grasses (30% ground cover), near large rockpiles.
C03	Samphire	0476127	7718320	4	20	10	5	7	Flat plains with rocky sandy clay soils, Mixed low samphire shrubs (25% ground cover), fringed by hummock grassland.
C04	Samphire	0476753	7718968	4	20	10	5	7	Mix of sandy rises and clay plains. Sandy rises contain scattered tall shrubs over tussock grasses (50% ground cover), while clay plains contain low scattered shrubs (5% ground cover).
C05	Mid-Slope	0476337	7718943	4	20	10	5	7	Gentle slopes with clay soils. Scattered tall shrubs over hummock grasses, (50% ground cover).
C06	Rocky Outcrop	0476201	7719279	4	20	16	0	7	Rocky slopes with scattered tall shrubs, over hummock grasses (60% cover), near large rockpiles.
		Total trap nights		**168**	**840**	**504**	**140**		

3.5.2 Camera Trapping & Bat Acoustic Recorders

Camera traps and acoustic bat detectors were deployed in both the November 2018, and the March / April 2019 survey. All camera traps were Reconyx HC500 HyperFire™ Semi-Covert IR, while two types of bat detectors were used: AnaBat Swift Passive Bat Detectors and D500x Ultrasound Detector / Recorders. Camera trap deployment details are provided in Table 3-6.

Table 3-6: Camera trap and bat detector survey effort across all surveys

Type	Survey	Habitat	Locations	No. of traps	Total trap nights
Camera trap	Nov 18	Rocky Outcrop	BC001, BC002, BC006	3	12
		Mid-slope	BC003, BC004, BC008, BC009	5	16
		Mangrove (outside Study Area)	BC005	1	4
		Rocky outcrop (outside Study Area)	BC010	1	3
				Total	**35**
	Mar 2019	Rocky Outcrop	C02, C06	4	32
		Mid-slope	C01, C05	4	32
		Samphire	C03, C04	4	32
		Rocky outcrop (outside Study Area)	QC01, QC02, QC03	3	24
				Total	**120**
Bat detector	Nov 18	Rocky Outcrop	BC001, BC006	2	8
		Mid-slope	BC004, BC009	2	8
				Total	**16**
	Mar 2019	Rocky Outcrop	C02, C06	2	16
		Mid-slope	C01, C05	2	8
		Samphire	C03, C04	2	8
				Total	**32**

3.5.3 Bird Surveys

Bird surveys were conducted during the November 2018 and March 2019 survey periods. Bird surveys were conducted in the morning, immediately after sunrise, and in the evening, just prior to sunset. The method involves searching 2 ha plots for 20 minutes and recording each species (and the number of individuals). Around 8-12 plots were searched each day. Plots were spread throughout all habitat types present at the site, with a focus on the floodplain and fringing habitat in order to sample migratory wader or shorebird species. All bird surveys were conducted in accordance with *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE, 2017)

3.5.4 Targeted Searching

Searches of rocky outcrop areas were carried out during both surveys, targeting both the Northern Quoll and the Pilbara Olive Python. This included diurnal searches largely focused on habitat assessments and recording of sign (scats and tracks). Nocturnal spotlight surveys were conducted during both surveys, searching

appropriate habitat for foraging nocturnal species. In total approximately 6 hours of spotlighting was carried out in both the pre-wet season and post-wet season surveys.

4 FLORA AND VEGETATION RESULTS

4.1 DESKTOP SURVEY

4.1.1 General Site Description

The King Bay to Hearson Cove valley is the only open valley of the Burrup Peninsula which crosses east-west across the Peninsula. The Project straddles the western end of the valley with a catenary sequence from the elevated rocky hills in the north and to the south, to upper and mid slopes incised by drainage features, through hummock grasslands and plains to the floor of the valley which has a large area of saline mud flats fringed by samphire and sandy swales of tussock grasslands.

4.1.2 Previous Surveys

Beard (1975) described the vegetation of the botanical province as predominantly open grassy plains or mixed grass and spinifex with shrub steppe occurring further inland on the granite plains. Beard (1975) broadly classified the vegetation of the Burrup Peninsula as *Triodia pungens* hummock grassland with very few shrubs.

Thackway and Cresswell (1995) described the vegetation as "Quaternary alluvial plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia translucens* (now *A. stellaticeps*) over *Triodia pungens* (now *T. epactia*). Samphire, *Sporobolus* and Mangal occur on marine alluvial flats".

Blackwell and Cala (1979) looked specifically at the vegetation of the Burrup Peninsula and described a group of five basic vegetation units for the area that were further divided into 28 communities. Blackwell and Cala (1979) recognised the Burrup Peninsula as part of the Abydos Plain which forms the landscape on the mainland, but also identified it as containing a unique mixture of coastal and Eremaean species in close association with species more typical of the Northern (Kimberley) Botanical Province.

In anticipation of future development, the DEC commissioned a study of the vegetation of the Burrup Peninsula, Dolphin, Angel and Gidley Islands and Inland Ranges (M.E. Trudgen & Associates, 2002). The study identified 240 vegetation associations (each with a small area of occurrence), a rich flora for its size (383 native vascular plant species from 54 families), and a high number of geographically restricted or uncommon species (M.E. Trudgen & Associates, 2002). A significant geographic based pattern for the distribution of floristic units on the peninsula, in accordance with landscape groups (i.e. rock piles, slopes, drainage lines, etc.), was also identified (Trudgen and Griffin, 2001; M.E. Trudgen & Associates, 2002). The vegetation of the Burrup Peninsula was found to be generally in very good or excellent condition, except in areas of coastal sand (M.E. Trudgen & Associates, 2002).

Trudgen & Griffin (2001) assessed the regional significance of vegetation on the Burrup Peninsula using the (Trudgen and Associates 2002) vegetation mapping as a base. It was outside of the terms of reference to map the Samphire flats in detail and scale limitations led rock outcrops and rock pockets to be mapped as a single unit, but with descriptions of 11 rock outcrop and rock pocket vegetation units included in Volume 1. These limitations aside, the mapping and vegetation association descriptions as well as the analysis of significance for flora and vegetation associations detailed in Trudgen & Griffin (2001) and M.E. Trudgen & Associates (2002) are the most comprehensive treatments of regional flora available. The two volumes form the basis of impact assessments for developments on the Burrup Peninsula subsequent to 2001.

Many private industry developments have commissioned independent studies on the Burrup Peninsula. Studies that overlap or are adjacent to the Project are summarised below. Although the vegetation associations mapped

by Trudgen and those mapped by botanists commissioned by private industry are generally similar, some differences are evident. The reasons for the differences generally include:

- Detailed description of samphire and beach vegetation associations. These were broadly mapped by Trudgen as one unit as they were not a part of the scope for that study;
- Detailed mapping of rockpile vegetation that was previously mapped by Trudgen as one unit/association due to scale restrictions when mapping the entire Core Study Area;
- Differences in rainfall prior to the surveys and subsequent effect on the dominance of shorter-lived perennial shrub species (e.g. *Acacia colei*, *Acacia bivenosa*); and
- More detailed survey/inspection of the site-specific survey area. The Trudgen mapping covered most of the Burrup Peninsula and to achieve mapping on that scale it was required to use aerial photo interpreted mapping in some areas.

Syntroleum Sweetwater – Astron Environmental (2001a)

The Syntroleum Sweetwater project was proposed for the southern section of the current Project Area. It was surveyed for vegetation and floristic characteristics in 1999 with a survey area extending further to the south and south west than the current Study Area. Approximately one third of the area had been previously disturbed. Six broad vegetation associations were identified and within these associations 14 vegetation assemblages were identified. *Terminalia supranitifolia* (P3) was identified during the survey. Weeds found during the survey included **Cenchrus ciliaris* (Buffel Grass), **Cenchrus setigerus* (Birdwood Grass), **Aerva javanica* (Kapok) and **Stylosanthes hamata* (Caribbean stylo). It was noted that the tall stands of *Eucalyptus victrix* and *Terminalia circumulata* (formerly *Terminalia canescens*) woodland occurring in the drainage areas and deep gullies provided important faunal habitat (moisture, shade, nesting sites etc) and add aesthetic value to the Burrup.

BFPL Ammonia – Astron Environmental (2001b)

The BFPL Ammonia processing site is immediately adjacent to the Project and a portion of the vegetation mapped by Astron Environmental (2001a) overlaps the current Project Area. Astron Environmental (2001a, 2001b) conducted two vegetation surveys to coincide with the wet summer season and the dry season. Seven broad vegetation types and 15 vegetation assemblages were found to occur within the project lease.

The vegetation assemblages considered of conservation significance based on criteria compiled from Astron Environmental (2001a, 2001b) and Trudgen *et al*. (2001), included:

- Vegetation assemblage 1a – rock pile vegetation;
- Vegetation assemblages 5a, 5b, 5c – drainage lines and broad drainage zone vegetation (especially mixed grevillea heath);
- Vegetation assemblages 6a, 6b and 6c – samphire communities;
- *Dolichandrone heterophylla* stand (rare on the Burrup) (now *Dolichandrone occidentalis*)

A total of 131 vascular species (100 dry season, 117 wet season) were recorded within the Study Area. However, as the rainfall for the wet and dry season was low, this may not represent the full total. No Declared Rare Flora was identified within the Study Area, but one Priority 3 Flora species (*Terminalia supranitifolia,* at the time of survey was classified as P1) was found. A total of 38 *Terminalia supranitifolia* individuals were located on or around the base of scree slopes and small rocky outcrops.

Dampier Nitrogen Pty Ltd Detailed Wet Season Survey (2005) and Addendum (2009) – Astron Environmental (2005)

Dampier Nitrogen Pty Ltd proposed a development of Site C within the King Bay / Hearson Cove Industrial Area. The area surveyed by Astron Environmental (2005) overlaps much of the northern end of the current Study Area as well as the tidal inlet and fringing vegetation in the centre of the current Project site. The Astron Environmental (2005) assessment covers a greater area than the current Project, encompassing a large area of rocky outcrop vegetation and tidal inlet that are outside of the current Project Area. Vegetation associations of the rock outcrops, samphire and tussock grass areas were described in detail. Twelve broad vegetation groups are divided into 79 associations.

The 2005 field survey recorded 143 flora taxa from 44 families. 23 *Terminalia supranitifolia* (P3) and 2 *Rhynchosia bungarensis* (P4) were identified. Two introduced species were recorded, **Cenchrus ciliaris* (buffel grass) and **Aerva javanica* (kapok bush). Two rockpile communities were considered to be of particular conservation significance. These occur outside of the current Project Area.

The mapping of the samphire vegetation in the Hearson Cove / King Bay Valley conducted by Astron Environmental in 2002 and included in the wet season report in 2005 is the most comprehensive assessment of the distribution of these vegetation assemblages on the Burrup Peninsula.

Pluto LNG Development Site B North - ENV Australia (2006)

Site B North is situated less than 500 m northwest of the Project.

One hundred and twelve taxa were collected from within the study site. One species of Priority flora, *Terminalia supranitifolia* (P3), was located at four sites within rockpiles and drainage lines. Eight special interest flora taxa were recorded (as per M. E. Trudgen & Associates, 2002). One in particular is considered of greater significance in relation to the Site B North project. *Fimbristylis* aff. *dichotoma* (M75-4) is not uncommon where it occurs. However, it is fairly restricted and a newly recognised taxon. Collection records exist at 21 locations on the Burrup Peninsula.

Two introduced species were recorded, **Cenchrus ciliaris* (buffel grass) and **Aerva javanica* (kapok bush).

One vegetation association mapped by M.E. Trudgen & Associates (2002) within Site B North is of conservation significance: *Triodia epactia* (Burrup form), *Cymbopogon ambiguus* hummock / tussock grassland (TeCa). The area of TeCa within Site B North represents less than 1% of the total area mapped for this association, and there is a relatively large number of occurrences on the peninsula. This association is only represented by 4% in the conservation zone, hence its significance.

Burrup Nitrates – Outback Ecology (2009)

The Burrup Nitrates Project is located adjacent to the BFPL ammonia project and less than 1 km to the east of the Project. Five broad vegetation types were identified during the flora survey. The five broad vegetation types identified on the Site correspond to those vegetation assemblages previously identified and mapped as occurring within the area (as per M. E. Trudgen & Associates, 2002). These vegetation types also broadly correspond with the vegetation associations mapped at the adjacent BFPL site by Astron Environmental (2001a).

Vegetation condition was described as Good to Very Good (Keighery, 1994). Three introduced species, **Cenchrus ciliaris* (Buffel Grass), **Aerva javanica* (Kapok bush) and **Vachellia farnesiana* were found during the survey. It was noted that the introduced **Cenchrus ciliaris* has increased its cover and dominance in the Coastal Flats vegetation type since the time of the M.E. Trudgen & Associates (2002) report.

No conservation significant flora species were identified within the site. While no Threatened or Priority Ecological Communities (**PEC**) are known on the Burrup Peninsula Based, analysis of the M.E. Trudgen & Associates (2002) mapping undertaken by ENV Australia (2006) identified that the community mapped as Sm and described as Saline Inlet and Supra-tidal Flats was considered to represent a significant vegetation association. It was noted that approximately 56% of this community's extent was represented within the proposed Burrup Peninsula Conservation Reserve.

4.1.3 Conservation Significant Vegetation

No Threatened Ecological Communities listed under the EPBC Act or BC Act are known to occur on the Burrup Peninsula (DBCA 2018).

Two PECs are known from the Burrup Peninsula:

- Burrup Peninsula rock pool communities. Priority 1: Calcareous tufa deposits. Interesting aquatic snails. Threats: recreational impacts, and potential development; possibly NO_x and SO_x emissions, weed invasion including **Passiflora foetida* (stinking passion flower); and

- Burrup Peninsula rock pile communities. Priority 1: Pockets of vegetation in rock piles, rock pockets and outcrops. Comprise a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Short-range endemic land snails. Threats: industrial development dust emissions. Weed invasion including **Cenchrus ciliaris* (Buffel Grass) and **Passiflora foetida* (stinking passion flower)

Locations of PECs listed in the DBCA databases for the Burrup Peninsula are shown in Figure 4-1. No known PECs are listed in the DBCA database as occurring in the Project area.

474000.000000 475500.000000 477000.000000 478500.000000 480000.000000 481500.000000

7726500.000000 7725000.000000 7723500.000000 7722000.000000 7720500.000000 7719000.000000 7717500.000000 7716000.000000

WITHNELL BAY ACCESS RD

ROB VITENBERGS DR (P)

MOF RD

KING BAY RD

STRECKFUSS PL (P)

VILLAGE RD

HEARSON COVE RD

BURRUP PENINSULA RD

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20180606_CAR002_Fig4-1 DBCA TECs&PECs.mxd

Figure 4-1: Conservation Significant Communities Identified by Department of Biodiversity Conservation and Attractions Database Search as Occurring in the Vicinity of the Study Area

Legend

DBCA_TecPec_Results

- Burrup Peninsula rock pile communities - P1
- Burrup Peninsula rock pool communities - P1
- *Study Area*
- Main Roads WA

N

750 375 0 750 Meters

1 centimeter = 346 meters

Date: 6/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Trudgen & Griffin (2001) assess "rarity" (and therefore significance) of vegetation based on methodologies outlined by Abrahams *et al*. (1995), using the minimum area for protection of an ecosystem as recommended by the International Union for the Conservation of Nature, and English and Blyth (1997). Using the formulas developed in these references, Trudgen & Griffin (2001) calculates vegetation rarity as governed by area, with 2,000 ha as the lower limit for definition of a "rare" undisturbed vegetation association and 30% remaining as the threshold for "threatened" status. Given this definition, all vegetation on the Burrup is "significant".

A map showing the frequency of vegetation types on the Burrup was produced by the Department of Mineral and Petroleum Resources (2002) utilising the results of M. E. Trudgen & Associates (2002). This map has a frequency scale ranging from 1 to 100 or more occurrences on the Burrup Peninsula. The map is a useful tool in assessing the regional significance of vegetation on any one area of the Burrup Peninsula. According to M. E. Trudgen & Associates (2002), ten or fewer occurrences of any vegetation association should be treated as significant, and more so if those occurrences are limited to the area zoned for industry.

Using Trudgen & Griffin's (2001) significance assessment criteria, the vegetation communities identified by M. E. Trudgen & Associates (2002) from the Study Area that are considered significant are listed in Table 4-1. There are a number of statistical artefacts in the dataset that elevate map units to significance without merit. These are identified in the comments of Table 4-1. Units coloured yellow indicate there are at least ten occurrences and as such do not qualify as significant under the classification scheme. They have been included in the table here as other developments on the Burrup may have reduced the number below ten occurrences and thus need to be considered as part of the cumulative impact of development on the Peninsula.

Table 4-1: Vegetation Communities from the Study Area that are Considered Significant using M. E. Trudgen & Associates (2002) Significance Assessment Criteria

Association Code	Association Name	Comments
***CcTs**	**Cenchrus ciliaris*, (*Triodia epactia* (BF)), (*Triodia angusta* (BF))grassland/hummock grassland with *Tephrosia* aff. *supina* (MET 12, 357), *Rhynchosia* cf. *minima* herbland	*Cc is a weed. This is red by simple reason of being unique but is not considered significant vegetation. Without the *Cc it would likely be TaTsRm which is also red but together would be 2 occurrences therefore dark orange.
ItTa/AbTa	This is mapped as a combination of ItTa and AbTa.	As individually they are both light orange, this is considered to be light orange also
Sm/*Cc/D	This is mapped as a combination of Samphire, **Cenchrus ciliaris* and Disturbed.	Sm is dark green, *Cc is a weed and D is disturbed so this vegetation is not of conservation significance.
Sm/Sv	This is mapped as a combination of Sm and Sv	Sm and Sv are medium and light green respectively so this is not considered to be of conservation significance, excepting that a discussion of the conservation significance of the tidal inlet vegetation is found below.
Sv	*Sporobolus virginicus* tussock grassland	Most of this vegetation is mapped as (Te)Sv, which indicates with or without *Triodia epactia*. It is considered here that Sv is synonymous with (Te)Sv (mapped light green) and therefore is not of conservation significance.
TaTsRm	*Triodia angusta* (BF) *Triodia epactia* grassland with *Tephrosia* aff. *supina* (MET 12,375) herbland and *Rhynchosia* cf. *minima* lianes	1 occurrence, but see note for *CcTs
AbCgTe	*Acacia bivenosa*, *Cassia glutinosa* open shrubland to shrubland over *Triodia epactia* (BF), **Cenchrus ciliaris* grassland	Trudgen: Dark Orange 2 to 4 Occurrences
ChAbSg	*Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* (Burrup form) hummock grassland	Trudgen: Dark Orange 2 to 4 Occurrences
Ev*CcTe	*Eucalyptus victrix* low open woodland to low woodland over (*Pittosporum phylliraeoides* var. *phylliraeoides*, *Rhagodia eremaea* high shrubs to shrubs) over **Cenchrus ciliaris*, *Triodia epactia* (BF) tussock/hummock grassland	Trudgen: Dark Orange 2 to 4 Occurrences
AbImTe	*Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* (BF) scattered low shrubs to low open shrubland over *Triodia epactia* (BF) hummock grassland to closed hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences

AbTa	*Acacia bivenosa* high open shrubs over *Triodia angusta* (BF) hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences
AbWaTe	*Acacia bivenosa* high shrubland over *Whiteochloa airoides*, *Triodia epactia* (BF) tussock/hummock grassland with patches of **Cenchrus ciliaris* grassland	Trudgen: Light Orange 4 to 9 Occurrences
EvAa	*Eucalyptus victrix* low woodland over A*cacia ampliceps* open heath over *Cyperus vaginatus, Eriachne tenuiculmis, Triodia angusta* (Burrup form) sedgeland and tussock/hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences
ItTa	*Indigofera trita* low shrubland over *Triodia angusta* (BF), (*Triodia epactia* (BF)) hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences
ChImTe	*Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa, Acacia coriaceae* subsp. *coriaceae*) scattered tall shrubs over *(Dichrostachys spicata)* scattered shrubs over *Indigofera monophylla* (BF) low open shrubs to low shrubland over *Triodia epactia* (BF) hummock grassland	Trudgen: Yellow 10 to 24 occurrences
EvDsTa	*Eucalyptus victrix* scattered low trees to low open woodland over *Dichrostachys spicata, (Acacia coriaceae subsp. coriaceae)* tall scattered shrubs to low open shrubland over *Triodia angusta* (BF) hummock grassland	Trudgen: Yellow 10 to 24 occurrences
GpCwTe	*Grevillea pyramidalis* subsp. *pyramidalis* open heath over *Corchorus walcottii* scattered low shrubs to low open heath over *Triodia epactia* (BF) hummock grassland	Trudgen: Yellow 10 to 24 occurrences
TcEtSe	*Terminalia circumulata* low woodland over *Eriachne tenuiculmis*, *Triodia epactia* (BF) grassland/hummock grassland with *Sesbania cannabina* herbland	Trudgen: Yellow 10 to 24 occurrences

Red = 1 occurrence; **Dark Orange** = 2 to 4 Occurrences; **Light Orange** = 5 to 9 Occurrences; **Yellow** = 10 to 24 Occurrences.

Additionally, Astron Environmental (2005) considered two of the seven rockpile vegetation types to be very rarely occurring. These are:

- 2e DhTs Low woodland of *Dolichandrone occidentalis* (formerly *heterophylla*), *Terminalia supranitifolia* with *Brachychiton acuminatus* over very open grassland of *Triodia epactia* (Burrup form) and *Cymbopogon ambiguous*; and

- 2f ErvDhBa Low woodland of *Erythrina vespertilio* with *Dolichandrone occidentalis* and *Brachychiton acuminatus* over very open grasses of *Cymbopogon ambiguus* with *Triodia epactia* (Burrup form) over annual herbs.

Because the Study Area contains the only known occurrence of *Dolichandrone occidentalis* on the Burrup, its occurrence on the rock piles here is considered to have very high conservation value. Additionally, although *Erythrina vespertilio* does occur elsewhere on the Burrup, it is not abundant or widespread. Its occurrence with *Dolichandrone occidentalis* gives this community high conservation value. These mapped areas do not occur in the Project Area but are close to the border in the central section between the two north stretching arms.

ENV Australia (2006) mapped the *Triodia epactia* (Burrup form), *Cymbopogon ambiguus* hummock / tussock grassland (TeCa). This association is only represented by 4% in the conservation zone, hence its significance. There are more than 100 occurrences of this vegetation association on the Peninsula.

M. E. Trudgen & Associates (2002) identifies the tidal inlet between Hearson Cove and King Bay as being of conservation significance. The basic vegetation units mapped by M. E. Trudgen & Associates (2002) in the tidal inlet were designated Sm and (Te)Sv. In the assessment of occurrence Sm is represented by 50 to 99 occurrences and (Te)Sv is represented by 25 to 49 occurrences, both above the 10-occurrence threshold. Outback Ecology (2009) note also that there is approximately 56% of the Sm extent represented within the Burrup Peninsula Conservation Reserve (now the Murujuga National Park), above the 30 % threshold proposed by M. E. Trudgen & Associates (2002).

4.1.3.1 Conservation Significant Flora

No plants declared rare or threatened under the EPBC Act are known from the Burrup Peninsula, or within 100 km of the Study Area. No plants declared rare under the WC Act are known from the Burrup Peninsula.

DBCA Database Searches did not identify any known Priority flora locations within the Study Area. Priority Flora located in the Roeburn Bioregion coastal zone and Islands is shown in Figure 4-2. Table 4-2 identifies known habitat associations, distribution and flowering times of these taxa and makes an assessment of the likelihood of occurrence for each taxon given the habitats present in the Study Area. For the taxa assessed as likely to occur in the Project Area, an assessment is made about the likelihood of detection given the climatic conditions during survey. Table 4-2 identifies five taxa of conservation significance that may occur in the Project.

Inset

Onslow

7740000

7725000

7710000

7695000

Figure 4-2: Conservation Significant Flora Identified by Department of Biodiversity Conservation and Attractions Database Search as Occuring in the Vicinity of the Study Area

Legend

Conservation Significant Flora

- Abutilon sp. Pritzelianum (S. van Leeuwen 5095), P1
- Goodenia pallida, P1
- Helichrysum oligochaetum, P1
- Tephrosia rosea var. Port Hedland (A.S. George 1114), P1
- Cucumis sp. Barrow Island (D.W. Goodall 1264), P2
- Pentalepis trichodesmoides subsp. hispida, P2
- Atriplex lindleyi subsp. conduplicata, P3
- Carpobrotus sp. Thevenard Island (M. White 050), P3
- Corchorus congener, P3
- Eleocharis papillosa, P3
- Eragrostis lanicaulis, P3
- Eragrostis surreyana, P3
- Eremophila forrestii subsp. viridis, P3
- Gomphrena cucullata, P3
- Gomphrena leptophylla, P3
- Gymnanthera cunninghamii, P3
- Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479), P3
- Owenia acidula, P3
- Schoenus punctatus, P3
- Stackhousia clementii, P3
- Terminalia supranitifolia, P3
- Themeda sp. Hamersley Station (M.E. Trudgen 11431), P3
- Triumfetta echinata, P3
- Vigna triodiophila, P3
- Goodenia nuda, P4
- Rhynchosia bungarensis, P4

N

4.52.25 0 4.5 Kilometers

1 centimeter = 2,500 meters

Date: 6/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190606_CAR002_Fig4-2 DBCA Consig flora.mxd

Table 4-2: Conservation Significant Flora identified from the Database Searches

Species	Current WA Conservation Status	Description & Habitat	Likelihood of Occurrence in Project Area and likelihood of Detection if Present
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	P1	Shrub to 1.5 m Red stony loam with *Acacia inaequilatera*, *Sida* sp., *A. coriacia, Hibiscus leptocladus*.	**Possible**. Known from 1 location 40 km to the east on the mainland.
Goodenia pallida	P1	Balmoral Homestead. Corolla very pale purple. Plain, dry red sand. Annual grassland, Acacia steppe.	Unlikely. No suitable Habitat.
Helichrysum oligochaetum	P1	Erect annual, herb, to ca 0.25 m high. Fl. yellow, Aug to Nov. Red clay. Alluvial plains.	Unlikely. No suitable habitat
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1	Erect, spreading shrub 1 m Straggly open tomentose perennial. All parts densely grey/white felt, except inner petals. Deep burgundy flowers. Lower leaves becoming large. Raceme terminal 22-38 cm long. Legume 2.5-3 cm, tomentose. coastal dune sands, Open shrubland of *Acacia coriacea* subsp. *coriacea* and *Acacia sabulosa* over scattered shrubs of *Tephrosia rosea* var. Port Hedland over *Triodia epactia*, **Cenchrus ciliaris* and **Aerva javanica*. Also Small rocky hillcrest adjacent to lower-lying saline drainage areas at or just above sea level. with *Triodia wiseana, T. epactia* hummock grassland.	**Possible** but most locations on rocky terrain closer to the coast.
Pentalepis trichodesmoides subsp. hispida	P2	0.5 m tall x 1.5 m wide with long stems extending from the base, or just above. Phyllodes, green-yellow lanceolate, tomentose, 8 x 0.9 cm, 3 prominent veins. Flowers yellow with 5 petals. Bracts present. Banks of creeks and edges of basalt screes	Unlikely. No suitable habitat.
Atriplex lindleyi subsp. conduplicata	P3	Open straggly rotund shrub, growing up to 0.2 m tall. Sparse tussock grassland of *Eragrostis xerophila*. Crabhole plains.	Unlikely. No suitable habitat.
Cucumis sp. Barrow Island (D.W. Goodall 1264)	P3	Barrow Island Nature Reserve Herbaceous climber, 0.4 m high, 0.4 m wide. Very sticky creeper. Stems and leaves hirsute. Leaves mid-green, trifoliate, simple from nodes at regular intervals. One leaf and flower at each node. Perianth 0.5 cm long, 5 bright yellow petals. Flower approximately 0.5 cm diameter. Gentle calcrete slope. Red, sandy loam. *Triodia angusta* with scattered *Grevillea pyramidalis*. Species in vicinity (burn area*): Acacia bivenosa, Acanthocarpus verticillatus, Adriana tomentosa, Corchorus congener, Diplopeltis eriocarpa*	Unlikely. Restricted to Barrow Island 140 km to the west. Flowering known from June and October.
Carpobrotus sp. Thevenard Island (M. White 050)	P3	Thevenard Island. Prostrate succulent, glabrous plant. Leaves sessile, triangular in cross section to 10 cm in length. Sides 17mm wide. Flowers cream, solitary, 3-5 cm in diameter on thick peduncles 4-5, 2 large, leaflike, others small. Fruit turbinate. Coarse white sand on top of dune. Disturbed area.	Unlikely. No suitable Habitat. Restricted to Thevenard Island 200 km to the south-west.
Corchorus congener	P3	Barrow Island. Spreading plant to 75 cm diameter. Old stems grey-brown. New stems pale green and plumose. Leaves pale green, dentate, oval, 1-3 cm long x 1-1.5 cm	Unlikely. Restricted to Barrow Island 140 km to the west. Flowering known from June and October.

Species	Current WA Conservation Status	Description & Habitat	Likelihood of Occurrence in Project Area and likelihood of Detection if Present
		wide, plumose. Flowers in umbels along stems. 4 bright yellow petals, numerous bright yellow stamens.	
Eleocharis papillosa	P3	Broad drainage area through sandy coastal plain Red clay over granite, open clay flats. Claypans. Mosaic of *Tecticornia* (formerly *Halosarcia*) low shrubland with mixed tussock grassland of *Sporobolus mitchellii, Eriachne benthamii, Eulalia aurea*.	Unlikely. No suitable habitat.
Eragrostis lanicaulis	P3	Knotty or bulbous rhizomatous, perennial, grass-like or herb, 0.45-0.5 m high. Fl. Mar to May or Aug to Oct. Red sandy clay. Flats.	Unlikely. No suitable habitat.
Eragrostis surreyana	P3	Tufted annual grass 1-2 cm high. Seepage/wetland areas on boulder/rocky areas. Stoney soil of red-brown sandy-clay. *Cyperus vaginatus, Schoenus falcatus, Fimbristylis rara, Schoenoplectus littoralis, Eragrostis* sp. Mt Montague, sedgeland - tussock grassland with *Stemodia grossa, Pluchea rubelliflora, Stylidium fluminense, Peplidium* sp. E herbland.	Unlikely. No suitable habitat
Eremophila forrestii subsp. viridis	P3	Shrub, 0.8 - 1.5 m tall, Flowers pink-cream. Red sands - red/brown sandy loams of flat interdunal swales (not within dunes). Generally occurs on the flats where a hardpan develops in between inland dunes. *Acacia tetragonophylla, A. stellaticeps, Triodia epactia.*	Unlikely. No suitable habitat
Gomphrena cucullata	P3	Prostrate, compact herb 20 cm high x 55 cm wide. Wiry red stems, young stems slightly hairy. Revolute, linear leaves, acute 10-47 mm long x 1 mm wide. Flowers white-pink, orange stamens, corolla 4 mm long. Flower head cylindrical, 20 mm long x 7 mm wide. Floodplain, red loam, Grassland	Unlikely. No suitable habitat
Gomphrena leptophylla	P3	Prostrate, compact herb 20 cm high x 60 cm wide. Stem leaves acute, mucronate, revolute linear leaves 10-30 mm long x 1-2 mm wide. Flowers green, yellow stamens. Axillary corolla 5 mm long. Cylindrical flower head 20 mm long x 7 mm wide. Bracts incurved. Flowers white, Mar to Sep. Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	**Possible**. Diverse range of habitat associations.
Gymnanthera cunninghamii	P3	Enderby Island, Erect, multistemmed shrub to 2 m tall, Stem very pliable, bronze colour, glabrous. Leaves opposite, margins undulating, glossy, lime green above, dull beneath. Petioles 2-2.5 cm long. Milky sap. Growing in beach sand at base of dolerite hills.	Unlikely. No suitable Habitat. Records of flowering in all months.
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	Alluvial silt and clay in floodplain. Brown clay loam, Tussock Grassland of *Eriachne* sp. over Very Open Herbs.	Unlikely. No suitable habitat
Owenia acidula	P3	Mardie Station. Small tree to 3m, often dense stands as suckers. Leaves pseudopinnate. Known from sand dune, Shrub steppe,	**Possible**. Easily detected from vegetative growth all year.

Species	Current WA Conservation Status	Description & Habitat	Likelihood of Occurrence in Project Area and likelihood of Detection if Present
Rhynchosia bungarensis	P4	Burrup Peninsula. Creeper Viscid, spreading 1 m high. Steeply sloping rock pile (boulder scree) on valley side, E facing. Orange brown loam between cobbles (vegetated patch). Medium grained volcanic. Fire >10 years. *Terminalia circumulata* high open shrubland (low open woodland) over *Acacia coriacea* subsp. *coriacea, Flueggia virosa* subsp. *melanthesoides* high open shrubland over *Scaevola spinescens* (narrow form), *Rhagodia eremaea* scattered shrubs over *Triodia epactia*	**Occurs in Project Area**. Locally common on the Burrup Peninsula. Suitable habitat exists on the rocky outcrops and slopes. Closest DBCA record less than 300 m from the Project Area. Specimens positively detected in Project Area by APM.
Schoenus punctatus	P3	Tufting plant to 80 cm high. Mid green leaves and culms. Leaf base dark red. Heads fine panicles above leaves. Spikelets brown to dark brown. Growing near *Stylidium fluminense, Cyperus* sp. and other water dependent spp. in creekline mud.	Unlikely. No suitable habitat
Stackhousia clementii	P3	King Bay - Hearson Cove tidal inlet, Burrup Peninsula. Lime-green, more or less leafless plant (or scale like leaves) to 45 cm with numerous erect slender branches. Flowers in clusters, forming a cylindrical spike. Woody base. Soft, silty saline soil over limestone - with much limestone and coral rubble, on small 'island' within tidal inlet (very rarely inundated). But also with Tall shrubland of Acacia bivenosa over open hummock grassland of Triodia epactia with open tussock grassland of *Cenchrus ciliaris, on sandy clay loam flats.	**Likely.** Located in the supratidal zone common to the Project Area. Records located 600 m to the east of the Project Area visited and healthy individuals noted. Records of flowering in all months.
Terminalia supranitifolia	P3	Rocky outcrops. Stunted canopy tree, very gnarled twisted trunk, intricate branches, grey in colour. Leaves glossy, silvery silky tomentum. Flowers lemon, fruits not winged. Leaves lemon-green colour.	**Occurs in Project Area**. Locally common in the central area of the Burrup Peninsula. Suitable habitat exists on the rocky outcrops. Closest DBCA record less than 300 m from the Project Area. Fertile specimen positively detected in Project Area by APM.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3	1.8m tall upright grass bases not buried in ground. Flowers Aug. Red clay. Clay pan, grass plain.	Unlikely. No suitable habitat
Triumfetta echinata	P3	Prostrate perennial shrub, spreading to ca 1 m diameter. sand dune with Soft spinifex.	Unlikely. No suitable habitat
Vigna triodiophila	P3	Burrup Peninsula. Herb. Slender vine entwined in *Triodia epactia* and rocks. Vine with thickened root - probably perennial but dying back to rootstock in dry. Flowers yellow. Rockpiles.	**Likely.** Locally common in the central area of the Burrup Peninsula. Suitable habitat exists on the rocky outcrops. Closest DBCA record is 700 m from the Project Area. Fertile material recorded in June.
Goodenia nuda	P4	Mardie Station Erect herb 0.3 m high x 0.2 m wide. Flowers yellow. Plain. Dry, red sand. Mesquite scrub.	Unlikely. No suitable Habitat.

M. E. Trudgen & Associates (2002) identified a number of species of conservation significance (Table 4-3). These are species identified as having high conservation value for being at the extent of their range or those for which there is a lack of scientific knowledge, or because their distribution is limited. Nine of these species are perennials, 16 are annuals, six are annual / ephemerals and five are ephemerals (one species was unknown). Some of the flora taxa of special interest listed by Trudgen has been accepted as a natural variation of a known and described taxa. *Rhynchosia* sp. Burrup (82-1C) is now known as *Rhynchosia bungarensis* (P4).

From the review of previous surveys it was noted that the Astron Environmental (2005) survey identified 23 *Terminalia supranitifolia* (P3). Most of these occur outside of the current Study Area. *Rhynchosia bungarensis* (P4) was also located in 2 areas.

Table 4-3: Flora Taxa of Special Interest as described by M. E. Trudgen & Associates (2002)

Characteristic of Interest	Flora Taxa
Uncommon or rare, very restricted, newly recognised taxa	*Stackhousia* sp. (BMor 153), *Euphorbia* sp. (B34-11), *Amaranthus* aff. *pallidiflorus* (D89), *Sida* aff. *cardiophylla* (B22-37), *Tephrosia* aff. *clementii* (5) B184, *Sida* aff. *fibulifera* (B181-5B), *Tephrosia* aff. *densa* (B16-22), *Sida* aff. *fibulifera* (B235-7), *Vigna* sp. Burrup (B18), *Sida* aff. *fibulifera* (D109).
Not common, very restricted, newly recognised taxa	*Cheilanthes* aff. *tenuifolia* (B18), *Euphorbia* sp. (G133), *Amaranthus* sp. (D111), *Triumfetta* cf. *propinqua* (B13-13), *Euphorbia* sp. (BPBS2), *Ehretia* ?(B23-22), *Euphorbia* sp. (D105-1)
Apparently rare, fairly geographically restricted, habitat restricted taxa	*Eragrostis* sp. Mt Montagu (M.E.Trudgen 15,246), *Rhynchosia* sp. King Bay (B181-13)
Apparently quite uncommon, but widespread taxa	*Cyperus blakeanus, Euphorbia* aff. *australis* type 1 (erect stems)
Locally common, moderately restricted, newly recognised taxa	*Paspalidium tabulatum* (Burrup form), *Themeda* sp. Burrup (B84)
Very uncommon, quite restricted, newly recognised taxa	*Tephrosia* aff. *clementii* (4) (M35-14), *Euphorbia* sp. (B170-4), *Abutilon* sp. Fortescue (M. Maier 28A-4), *Sida* aff. *fibulifera* (B64-13B)
Not uncommon where occurs, fairly restricted, newly recognised taxa	*Fimbristylis* aff. *dichotoma* (M75-4), *Tephrosia* aff. *densa* (B17)
Locally very common to abundant, moderately restricted, newly recognised taxa	*Triodia angusta* (Burrup form), *Corchorus walcottii, Triodia epactia* (Burrup form) *Triumfetta appendiculate* (Burrup form), *Triodia wiseana* (Burrup form), *Euphorbia tannensis* subsp. *eremophila* (Burrup form), *Rhynchosia* sp. Burrup (82-1C)
Species at or near their southern end of range and not common locally	*Abutilon indicum* var. *australiense*

4.1.4 Introduced Flora

No Declared weeds under the BAM Act have been previously recorded in the Study Area. Under the *Environmental Weed Strategy for Western Australia* (Department of Conservation and Land Management, 1999) weeds are rated according to three criteria:

- Invasiveness: ability to invade bushland in good to excellent condition or ability to invade waterways;
- Distribution: wide current or potential distribution including consideration of known history of widespread distribution elsewhere in the world; and
- Environmental Impacts - ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

The rating of each weed is then given according to the following scoring system:

- High: a weed species would have to score yes for all three criteria. Rating a weed species as high would indicate prioritising this weed for control and / or research i.e. prioritising funding to it;
- Moderate: a weed species would have to score yes for two of the above criteria. Rating a weed species as moderate would indicate that control or research effort should be directed to it if funds are available, however it should be monitored (possibly a reasonably high level of monitoring);
- Mild: a weed species scoring one of the criteria. A mild rating would indicate monitoring of the weed and control where appropriate; and
- Low: a weed species would score none of the criteria. A low ranking would mean that this species would require a low level of monitoring.

Weeds species previously known from the Burrup Peninsula and their rating are:

- **Aerva javanica* - Kapok — High
- **Cenchrus ciliaris* - Buffel Grass — High
- **Cenchrus setigerus* - Birdwood Grass — High
- **Cenchrus enchinatus* - Mossman River Grass — Low
- **Rumex vesciarius* - Ruby Dock — High
- **Stylosanthes hamata* - Caribbean stylo — Mild
- **Bidens bipinnata* - Bipinnate Beggar-Ticks — TBA
- **Euphorbia hirsuta* - Strawberry Weed — Moderate
- **Passiflora foetida* - Wild Passionfruit — High
- **Solanum nigrum* - Nightshade — Moderate
- **Chloris barbata* - Purple-top chloris — Low
- **Pennisetum setaceum* - Fountain grass — Mild

- **Malvastrum americanum* – Spiked Malvastrum Moderate

Trudgen *et al*. (2001) noted weed invasion of species not well established on the Peninsula which is occurring through the movement of seed on vehicles and establishing on roadsides. Some of these are native species that are very uncommon on the Burrup Peninsula but are appearing on roadsides and may become invasive. Three species of Acacia – *A. stellaticeps*, *A. trachycarpa* and *A. ancistrocarpa* are of noted as of concern for these reasons.

4.2 FIELD SURVEY

4.2.1 Survey Conditions

The post-wet season field survey 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 adequate post-wet season survey conditions.

4.2.2 Summary of the quadrat data

Fifty-nine detailed surveys were conducted within the Study Area. The field survey recorded 127 taxa, including species, subspecies and variants, from 34 Families. Three hundred and ninety taxa have been recorded for the Burrup Peninsula (Astron Environmental, 2005). Astron Environmental (2005) recorded 143 taxa from 44 families for Site C and the 'Site C and F amalgamation' zone that overlaps the current Study Area. As the Astron Environmental (2005) survey area was much larger and contained more vegetation associations than the current Study Area, it is not expected that the same level of floristic richness will be obtained from the Study Area.

A higher rainfall, closer to a seasonal long-term average, preceding the survey may have returned a greater number of total species present on the site. Given the knowledge available from previous surveys, however, the expected difference would be less than 5%. A higher rainfall may have had greater influence over the abundance of a small suite of ephemeral and short-lived perennial species recorded at each site, which were recorded in low densities in the present survey but at higher densities in previous surveys.

4.2.3 Floristic composition vegetation classification

Cluster analysis returned 12 groups of sites. The results of the cluster analysis are displayed as a dendrogram in Figure 4-3. The analysis broadly groups the survey sites based on their position in the landscape, as shown in Table 4-4 and Figure 4-4.

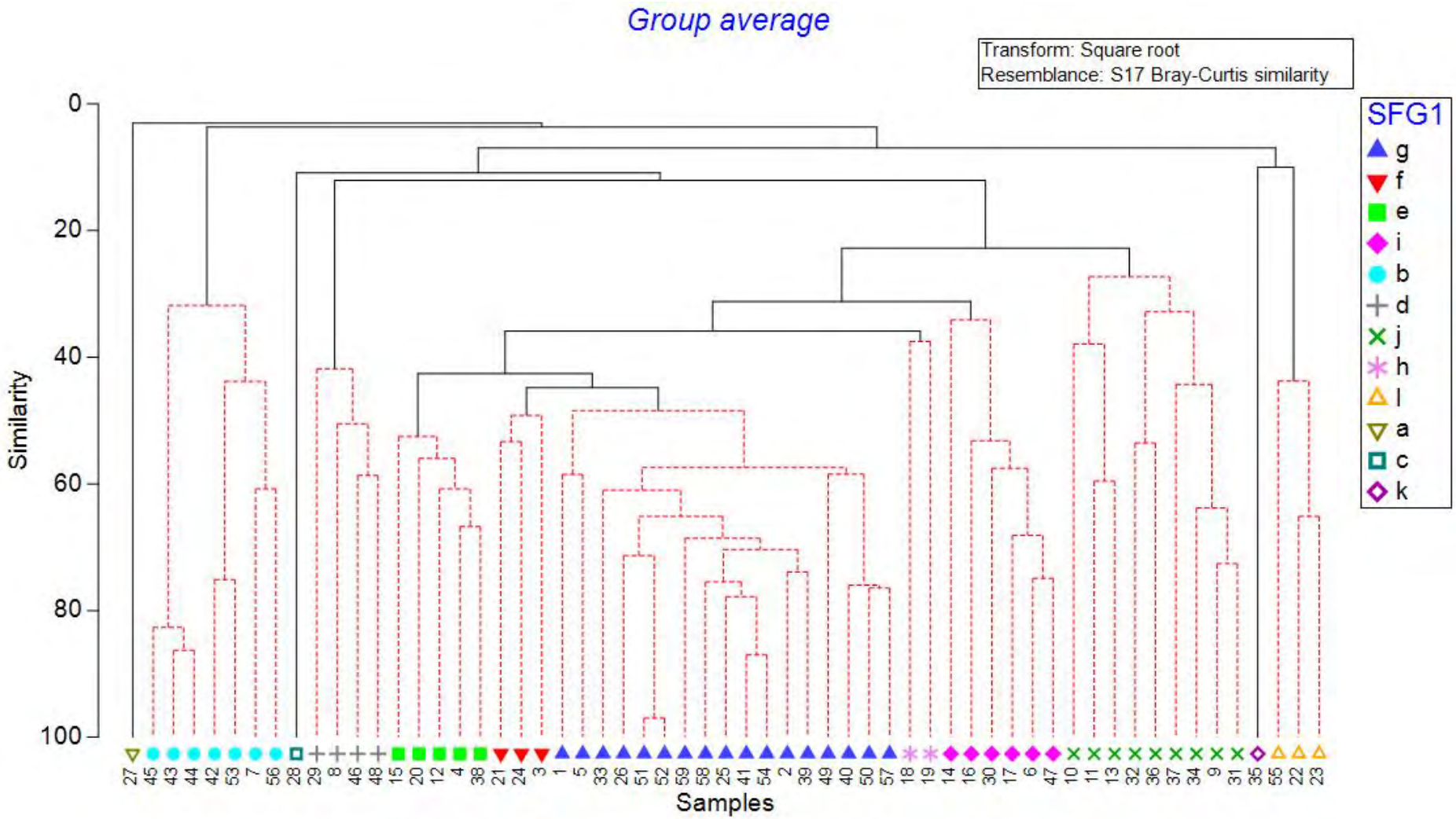


Figure 4-3: Cluster Analysis of the APM Vegetation Communities of the Study Area

Table 4-4: Groups of sites determined from Cluster analysis and their landscape position

CLUSTER group	Detailed Survey Sites	Landscape Position	CLUSTER group	Detailed Survey Sites	Landscape Position
a	27	Slope	g	50	upper slope
b	7	Inlet		51	upper slope
	42	Sandbank		52	upper slope
	43	Inlet		54	lower slope
	44	Inlet		57	lower slope
	45	Inlet		58	lower slope
	53	Sandbank		59	mid slope
	56	Sandbank	h	18	lower slope
				19	lower slope
c	28	Lower slope	i	6	lower slope
d	8	Sandbank		14	lower slope
	29	Sandbank		16	lower slope
	46	Sandbank		17	lower slope
	48	Sandbank		30	lower slope
				47	lower slope
e	4	Shallow drainage	j	9	lower slope
	12	Lower slope		10	outcrop
	15	Lower slope		11	outcrop
	20	Lower slope		13	outcrop
	38	Mid slope		31	rehabilitation
f	3	Outcrop		32	mid slope
	21	Outcrop		34	lower slope
	24	Outcrop		36	lower slope
				37	lower slope
g	1	drainage	k	35	Sandbank
	2	mid slope	l	22	drainage
	5	lower slope		23	drainage
	25	upper slope		55	drainage
	26	outcrop			
	33	mid slope			
	39	low rocky rise			
	40	slope			
	41	low rocky rise			
	49	lower slope			

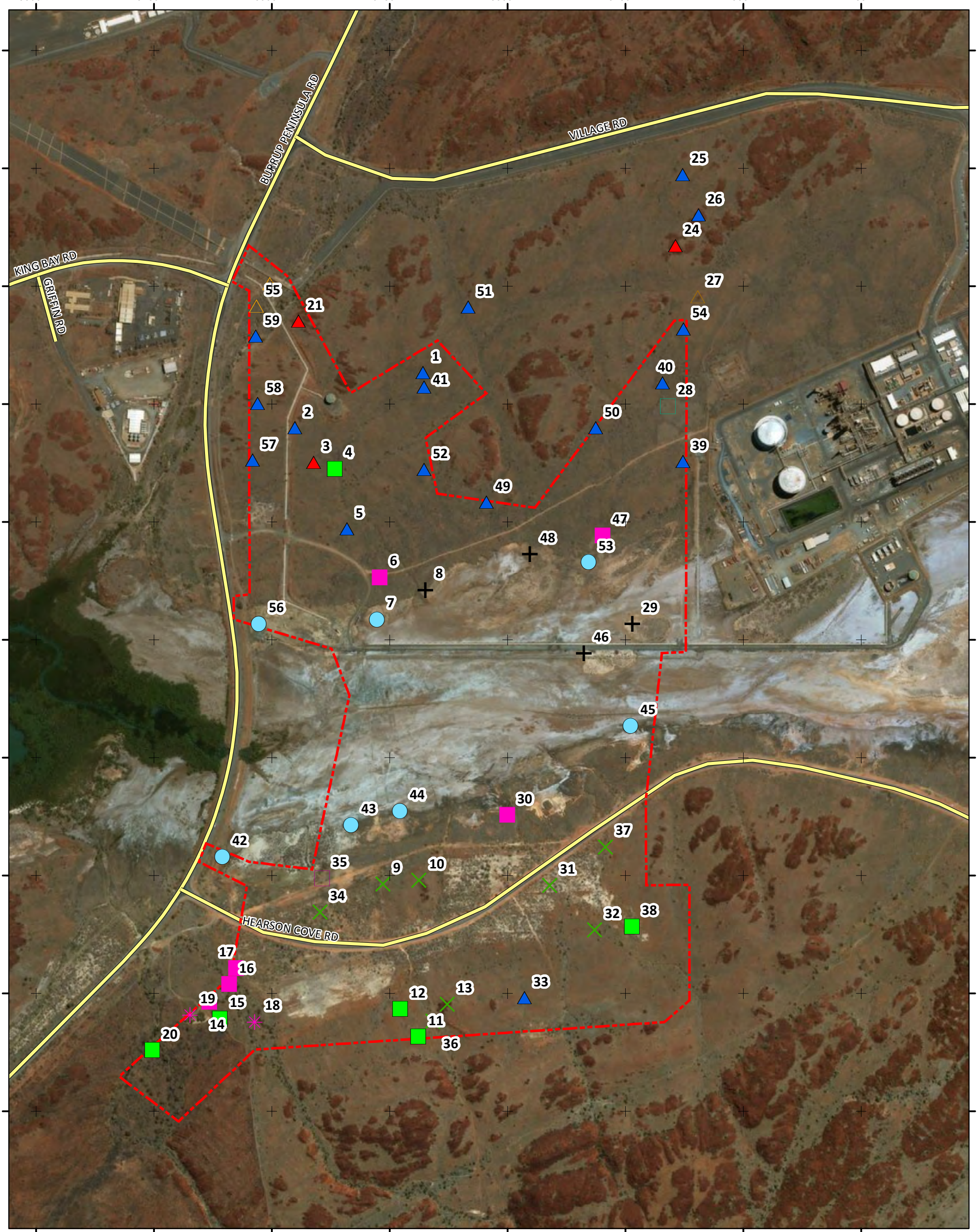


Figure 4-4: Detailed Survey Sites Grouped by Cluster Analysis

Legend

△	a	+	d	▲	g	×	j
●	b	■	e	✳	h	□	k
□	c	▲	f	■	i	△	l

N

160 80 0 160 Meters

1 centimeter = 75 meters

Date: 7/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190606_CAR002_Fig4-4 Detailed Survey Sites Grouped by Cluster Analysis.mxd

4.2.4 Structural vegetation classification

Vegetation has been mapped using structural descriptions to the level of Association across the Study Area by M. E. Trudgen & Associates (2002), and across much of the northern and all of the central and southern sections of the Study Area by Astron Environmental (1999, 2005). As M. E. Trudgen & Associates (2002) mapped the region at the association scale, APM have prioritised retention of descriptions published in the 2002 report where they are still relevant. This is to facilitate impact assessment as many completed projects on the Burrup use the 2002 report associations which allows for calculation of cumulative impact. Astron Environmental (2005) provides a more detailed description and mapping of rocky outcrop and tidal inlet vegetation associations and has mapped the area of tidal inlet extensively beyond the current project. APM have prioritised retention of the 2005 report descriptions where relevant, to allow for calculations of local cumulative impact.

In a few situations neither the M. E. Trudgen & Associates (2002) or Astron Environmental (2005) mapping adequately described the vegetation present. Astron Environmental (2005) also noted discrepancies between the vegetation present in 2005 and that recorded by M. E. Trudgen & Associates (2002). It is considered that the vegetation of the Burrup Peninsula is highly dynamic as a consequence of the stochastic nature of the magnitude and frequency of rainfall events. The dominance of short-lived perennial species in the vegetation composition means there can be significant fluctuations in the structure and floristic composition of specific locations over time.

35 vegetation associations were mapped by APM at the Study Area. Each association and its abbreviation is listed in Table 4-5. The mapped locations of these associations within the Study Area are shown in Figure 4-5 (north section) and Figure 4-6 (south section). A species by site matrix is presented in Appendix I.

Table 4-5: APM Vegetation Associations and Abbreviations

Abbreviation	APM Vegetation Community Description
(Te)Sv	Grassland of *Sporobolus virginicus*, *Eriachne mucronata* and *Paspalidium tabulatum* (30-70%) with scattered *Triodia epactia*. Evidence that **Cenchrus ciliaris* and **Aerva javanica* are common in wet season.
*Cc*AjTt	**Cenchrus ciliaris*, **Aerva javanica* with *Trianthema turgidifolia.*
*CcTs	**Cenchrus ciliaris*, (*Triodia epactia* (BF)), (*Triodia angusta* (BF))grassland / hummock grassland with *Tephrosia supina* (MET 12, 357), *Rhynchosia* cf. *minima* herbland
AbCgTe	*Acacia bivenosa*, *Cassia glutinosa* open shrubland to shrubland over *Triodia epactia* (BF), **Cenchrus ciliaris* grassland
AbHlCwTe	High shrubland of *Acacia bivenosa* with scattered *Hakea lorea*, *Dolichandrone occidentalis*, *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* (Burrup form) with occasional *Triodia angusta*
AbHlTe	Tall shrubland of *Acacia bivenosa* over open shrubland of *Hakea lorea*, *Acacia colei* over hummock grassland of *Triodia epactia* (Burrup form) over herbland.
AbImTe	*Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* (BF) scattered low shrubs to low open shrubland over *Triodia epactia* (BF) hummock grassland to closed hummock grassland
AbTa	*Acacia bivenosa* high open shrubs over *Triodia angusta* (BF) hummock grassland
AbTe*Cc	Previously disturbed and rehabilitated. *Acacia bivenosa* tall shrubland (30-70%, 2.5m) over Hummock Grassland of *Triodia epactia* (30-70%) with **Cenchrus ciliaris*
AbTtPt	High scattered (<2%) to very open shrubland (2-5%; 2m) *A. bivenosa* over low shrubland (10-30%; <1m) *Trianthema turgidifolia* over tussock grassland (10-30%) of *Paspalidium tabulatum*
AiGpTe	Tall shrubland of *Acacia inaequilatera* and *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* (Burrup form) over herbland of *Gomphrena cunninghamii*, *Abutilon lepidum*, *Trichodesma zeylanicum*, *Trachymene oleracea*
BaAcIc	Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea*, *Scaevola* aff *spinescens*, *Ipomoea costata* over herbs and very open grassland of *Triodia epactia* (Burrup form) with *Cymbopogon ambiguus* and *Paspalidium clementii*

ChAbSg	*Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* (Burrup form) hummock grassland
ChImTe	*Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa, Acacia coriacea* subsp. *coriacea*) scattered tall shrubs over (*Dichrostachys spicata*) scattered shrubs over *Indigofera monophylla* (BF)
ChTh	*Corymbia hamersleyana* scattered low trees to low woodland over *Acacia bivenosa*, *Acacia colei*, scattered tall shrubs to low open shrubland over *Indigofera monophylla* over *Triodia epactia*, *Themeda* sp. *Burrup* hummock / tussock grassland
Ev*CcTe	*Eucalyptus victrix* low open woodland to low woodland over (*Pittosporum phillyreoides* var. *phillyreoides*, *Rhagodia eremaea* high shrubs to shrubs) over **Cenchrus ciliaris*, *Triodia epactia* (BF) tussock/hummock grassland
EvAa	*Eucalyptus victrix* scattered low trees to low open woodland over *Acacia bivenosa* scattered tall shrubs to high open shrubland over *Triodia angusta* (Burrup form) hummock grassland
EvAbTa	*Eucalyptus victrix* scattered low trees to low open woodland over *Acacia bivenosa* scattered tall shrubs to high open shrubland over *Triodia angusta* (Burrup form) hummock grassland
EvDsTa	*Eucalyptus victrix* scattered low trees to low open woodland over *Dichrostachys spicata*, (*Acacia coriacea* subsp. *coriacea*) tall scattered shrubs to low open shrubland over *Triodia angusta* (BF) hummock grassland
EvTc	*Eucalyptus victrix* and *Terminalia circumulata* over Acacia coriacea with *Cyperus vaginatus*, *Cenchrus ciliaris* and *Passiflora foetida*
FbBaTsAc	Open low woodland of *Ficus brachypoda*, *Brachychiton acuminatus*, *Terminalia supranitifolia* over mixed shrubland of *Acacia coriacea*, *Scaevola* aff *spinescens*, *Rhagodia preissii* subsp *obovata* over open *Cymbopogon ambiguus* with *Triodia epactia* (Burrup form).
FvRpAc	Shrubland of *Flueggea virosa* subsp. *melanthesoides*, *Rhagodia preissii* subsp. *obovata*, *Alectryon oleifolius* subsp. *oleifolius*, *Scaevola* aff. *spinescens*, *Acacia coriacea* over very open *Triodia epactia* (Burrup form)
GpCwTe	*Grevillea pyramidalis* subsp. *pyramidalis* open heath over *Corchorus walcottii* scattered low shrubs to low open heath over *Triodia epactia* (BF) hummock grassland
Lv	Dwarf Shrubland over Low Open Grassland On slightly elevated sandy silts or fringes of inlet
TaTsRm	*Triodia angusta* (BF) *Triodia epactia* grassland with *Tephrosia* aff. *supina* (MET 12,375) herbland and *Rhynchosia* cf. *minima lianes*
TcEtSe	*Terminalia canescens* low woodland over *Eriachne tenuiculmis*, *Triodia epactia* (BF) grassland / hummock grassland with *Sesbania cannabina* herbland
Te	*Triodia epactia* (BF) hummock grassland
TeAb	*Triodia epactia* (BF) hummock grassland with scattered *Acacia bivenosa* shrubs
TeAtSd	(previously disturbed) Scattered *Acacia trachycarpa* over *Triodia epactia* hummock grassland with *Streptaglossa decurrens* herbfield
TeCa	*Triodia epactia* (BF), *Cymbopogon ambiguus* hummock / tussock grassland
TeRm	*Triodia epactia* (BF) hummock grassland with *Rhynchosia* cf. *minima lianes*
TeTh	*Triodia epactia* (BF), *Themeda* sp. *Burrup* (B84) hummock / tussock grassland
Tht	Open (2%) to dwarf shrubland (10-20%; <0.5m) of *Tecticornia halocnemoides* subsp. *tenuis* with occasional (2%) *Tecticornia pruinosa*, *Tecticornia indica* subsp. *leiostachya*, *Trianthema turgidifolia*.
ThtTil	Dwarf open shrubland to heath (varies from 2-10% to 20-40%; <0.5m) of *Tecticornia halocnemoides* subsp. *tenuis* with *Tecticornia indica* subsp. *leiostachya*
Tw	*Triodia wiseana* hummock grasslands

476000.000000

476500.000000

7719500.000000

7719000.000000

Roads and Infrastructure
TeRm
FbBaTsAc
TeRm
BaAcIc
BaAcIc
BaAcIc
TeCa
TeRm
TeAb
AiGpTe
Tw
AiGpTe
Roads and Infrastructure
AbImTe
TeRm
AbHlCwTe
AbImTe
Roads and Infrastructure
AbTa
AbTtPt
Lv
ThtTil
(Te)Sv
ThtTil
Roads and Infrastructure
Roads and Infrastructure
Roads and Infrastructure
ThtTil
Roads and Infrastructure
Roads and Infrastructure
(Te)Sv
Roads and Infrastructure
ThtTil
ThtTil
Tht
TeAtSd
EvAbTa
TeAtSd
Roads and Infrastructure
AbTe*Cc
EvAa
EvAa
EvAbTa
EvAa
Roads and Infrastructure
EvTc
EvAbTa
BaAcIc
TeAb
TeAb
BaAcIc
BaAcIc
BaAcIc
FvRpAc
FvRpAc
Roads and Infrastructure
BaAcIc
Te
AbHlTe
TeAb
TeRm
TeAb
TeAb
FbBaTsAc
FbBaTsAc
BaAcIc
BaAcIc
Te
BaAcIc
Roads and Infrastructure
BaAcIc
ChAbSg
TeAb
AiGpTe
TeAb
BaAcIc
AbImTe
ChAbSg
roads and infrastructure
Te
BaAcIc
BaAcIc
Te
AbImTe
BaAcIc
Te
roads and infrastructure
*Cc*AjTt
AbImTe
AbTa
AbTa
AbTa
AbTa
AbTa
(Te)Sv
(Te)Sv
(Te)Sv
(Te)Sv
(Te)Sv
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
Roads and Infrastructure
roads and infrastructure
Roads and Infrastructure
ThtTil
ThtTil
Roads and Infrastructure
Roads and Infrastructure
Roads and Infrastructure
Roads and Infrastructure
Roads and Infrastructure
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
ThtTil
Tht

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190611_CAR002_Fig4-5 Vegetation communities north.mxd

Figure 4-5: APM (2019) Vegetation Communities of the Study Area (North)

Legend

- *Study Area*

APM 2018/2019

- (Te)Sv
- *Cc*AjTt
- *CcTs
- AbCgTe
- AbHlCwTe
- AbHlTe
- AbImTe
- AbTa
- AbTe*Cc
- AbTtPt
- AiGpTe
- BaAcIc
- ChAbSg
- ChAbTe
- ChImTe
- ChTh
- Ev*CcTe
- EvAa
- EvAbTa
- EvDsTa
- EvTc
- FbBaTsAc
- FvRpAc
- GpCwTe
- Lv
- Roads and Infrastructure
- TaTsRm
- TcEtSe
- Te
- TeAb
- TeAtSd
- TeCa
- TeRm
- TeTh
- Tht
- ThtTil
- Tw
- roads and infrastructure

Veg_Mudflats

- Veg_Mudflats

N

90 45 0 90 Meters

1 centimeter = 40 meters

Date: 11/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

476000.000000 476500.000000

7718500.000000 7718000.000000 7717500.000000

roads and infrastructure TeAb AbImTe AbImTe AbImTe AbImTe Roads and Infrastructure AbTa AbTa HhtHil AbTtPt Lv
Te BaAcIc ChAbSg AbTa AbTa (Te)Sv (Te)Sv (Te)Sv
BaAcIc Te AbImTe AbTa AbTa HhtHil (Te)Sv (Te)Sv HhtHil
BaAcIc Te BaAcIc (Te)Sv HhtHil
roads and infrastructure roads and infrastructure Roads and Infrastructure (Te)Sv HhtHil
roads and infrastructure *Cc*AjTt HhtHil HhtHil
Roads and Infrastructure (Te)Sv
HhtHil
Roads and Infrastructure
HhtHil
Roads and Infrastructure Roads and Infrastructure (Te)Sv Roads and Infrastructure
HhtHil HhtHil
Hht
Hht AbTa
AbImTe
Hht AbTa AbTa AbTe*Cc
Hht
AbTa
HhtHil AbTa Roads and Infrastructure AbTa *CcTs
Roads and Infrastructure (Te)Sv (Te)Sv HhtHil AbTa AbTe*Cc Roads and Infrastructure AbTe*Cc
AbTa AbTa (Te)Sv AbTe*Cc BaAcIc
Roads and Infrastructure HhtHil
Roads and Infrastructure AbTe*Cc AbTe*Cc
AbTe*Cc AbTe*Cc
Roads and Infrastructure ChTh
AbTe*Cc TeTh
ChImTe
EvDsTa
TeTh
TaTsRm
TeTh
AbCgTe EvDsTa BaAcIc BaAcIc TeTh
Roads and Infrastructure Roads and Infrastructure
Ev*CcTe Roads and Infrastructure
Ev*CcTe GpCwTe TeTh
AbCgTe TcEtSe ChAbTe
AbCgTe BaAcIc
ChImTe TeTh
Ev*CcTe ChImTe
Ev*CcTe

Figure 4-6: APM (2019) Vegetation Communities of the Study Area (South)

Legend

- *Study Area*
- **APM 2018/2019**
  - (Te)Sv
  - *Cc*AjTt
  - *CcTs
  - AbCgTe
  - AbHlCwTe
  - AbHlTe
  - AbImTe
  - AbTa
  - AbTe*Cc
  - AbTtPt
  - AiGpTe
  - BaAcIc
  - ChAbSg
  - ChAbTe
  - ChImTe
  - ChTh
  - Ev*CcTe
  - EvAa
  - EvAbTa
  - EvDsTa
  - EvTc
  - FbBaTsAc
  - FvRpAc
  - GpCwTe
  - Hht
  - HhtHil
  - Lv
  - Roads and Infrastructure
  - TaTsRm
  - TcEtSe
  - Te
  - TeAb
  - TeAtSd
  - TeCa
  - TeRm
  - TeTh
  - Tw
  - roads and infrastructure
- **Veg_Mudflats**
  - Veg_Mudflats

N

90 45 0 90 Meters

1 centimeter = 45 meters

Date: 11/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190611_CAR002_Fig4-6 Vegetation communities south.mxd

The vegetation associations recorded by APM for the Study Area organised by Formation Code (e.g. 10.4.2; Type 1 as appears in the original publications) and Formation Description are:

10.4.*2* *Eucalyptus victrix* scattered low trees, low open woodlands and low woodlands. These vegetation associations occur in small shallow creek lines that are dry for much of the year. There are no rockpools associated with this vegetation type in the Study Area.

EvDsTa *Eucalyptus victrix* scattered low trees to low open woodland over *Dichrostachys spicata*, (*Acacia coriaceae* subsp. coriaceae) tall scattered shrubs to low open shrubland over *Triodia angusta* (BF) hummock grassland

Ev*CcTe *Eucalyptus victrix* low open woodland to low woodland over (*Pittosporum phylliraeoides* var. *phylliraeoides*, *Rhagodia eremaea* high shrubs to shrubs) over **Cenchrus ciliaris*, *Triodia epactia* (BF) tussock/hummock grassland

EvAbTa *Eucalyptus victrix* scattered low trees to low open woodland over *Acacia bivenosa* scattered tall shrubs to high open shrubland over *Triodia angusta* (Burrup form) hummock grassland

EvAa *Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus*, *Eriachne tenuiculmis*, *Triodia angusta* (Burrup form) sedgeland and tussock/hummock grassland

10.4.5 *Corymbia hamersleyana* scattered low trees to low woodlands.

ChImTe *Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa*, *Acacia coriaceae* subsp. *coriaceae*) scattered tall shrubs over (*Dichrostachys spicata*) scattered shrubs over *Indigofera monophylla* (BF)

ChTh *Corymbia hamersleyana* scattered low trees to low woodland over *Acacia bivenosa, Acacia colei*, scattered tall shrubs to low open shrubland over *Indigofera monophylla* over *Triodia epactia*, *Themeda* sp. Burrup hummock/tussock grassland

ChAbTe *Corymbia hamersleyana* scattered trees to low open woodland over *Acacia bivenosa* open shrubland over *Triodia epactia* (Burrup form) open to closed hummock grassland

ChAbSg *Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* (Burrup form) hummock grassland. *Stemodia grossa* was present in lower abundance due to late wet season rainfall, but a large number of juvenile plants were observed.

10.4.7 *Terminalia circumulata* scattered low trees to low forest

TcEtSe *Terminalia circumulata* low woodland over *Eriachne tenuiculmis, Triodia epactia* (BF) grassland/hummock grassland with *Sesbania cannabina* herbland. *Sesbania cannabina* was less abundant in 2018/19 than described by Trudgen and Associates 2002, likely due to seasonal conditions.

10.4.13 *Grevillea pyramidalis* subsp. *pyramidalis* scattered shrubs to high shrublands

GpCwTe *Grevillea pyramidalis* subsp. pyramidalis open heath over *Corchorus walcottii* scattered low shrubs to low open heath over *Triodia epactia* (BF) hummock grassland. *Corchorus walcottii* was not recorded in the 2018/19 survey, however that may be as a result of seasonal conditions.

10.4.18 *Acacia bivenosa* (with various other species) scattered shrubs to high shrubland

AbTe*Cc *Acacia bivenosa* tall shrubland (30-70%, 2.5m) over Hummock Grassland of *Triodia epactia* (30-70%) with **Cenchrus ciliaris.* All areas mapped as this unit are previously disturbed.

AbTa *Acacia bivenosa* high open shrubs over *Triodia angusta* (BF) hummock grassland

AbCgTe *Acacia bivenosa*, *Senna glutinosa* subsp. *glutinosa* (formerly *Cassia glutinosa*) open shrubland to shrubland over *Triodia epactia* (BF), **Cenchrus ciliaris* grassland. *Senna glutinosa* subsp. *glutinosa* was less abundant in 2018/19 than described by Trudgen, however that is likely a consequence of seasonal conditions, and as such, the original description is retained.

AbImTe *Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* (BF) scattered low shrubs to low open shrubland over *Triodia epactia* (BF) hummock grassland to closed hummock grassland

10.4.28 Hummock grasslands, hummock/tussock grasslands

TaTsRm *Triodia angusta* (BF) *Triodia epactia* grassland with *Tephrosia* aff. *supina* (MET 12,375) herbland and *Rhyncosia* cf. *minima lianes*

Te *Triodia epactia* (BF) hummock grassland. Found on plateaus and upper slopes where the soils are red brown loam with pebbles. Associated species include *Grevillea pyramidalis* subsp. *pyramidalis* and *Indigofera monophyla*.

TeAb *Triodia epactia* (BF) hummock grassland with scattered *Acacia bivenosa* shrubs

TeCa *Triodia epactia* (BF), *Cymbopogon ambiguus* hummock/Tussock grassland

TeTh *Triodia epactia* (BF), *Themeda* sp. Burrup (B84) hummock/tussock grassland. The Themeda collected was identified as *Themeda triandra* and was in lower abundance in 2018/19 than described by Trudgen and Associates 2002. The nomenclature is due to taxonomic revision and the abundance is likely a result of climatic conditions.

TeRm *Triodia epactia* (BF) hummock grassland with *Rhynchosia* cf. *minima* lianes

Tw *Triodia wiseana* hummock grasslands

10.4.29 Tussock grasslands and tussock/hummock grasslands

(Te)Sv *Sporobolus virginicus* tussock grassland: Recorded on the edge of mud and tidal flats in soil of brown sandy loam with shell fragments. This unit varies to include *Triodia epactia* and *Eragrostis falcata* grassland.

*CcTs **Cenchrus ciliaris*, (Triodia epactia (BF)), (*Triodia angusta* (BF))grassland/hummock grassland with *Tephrosia* aff. *supina* (MET 12, 357), *Rhyncosia* cf. *minima* herbland

Astron 2005 Type 1 Mixed open shrubland over low open shrubland of *Tephrosia* aff *supina*/*Indigofera monophylla* over hummock grassland of *Triodia epactia* (Burrup form).

AbHlCwTe High shrubland of *Acacia bivenosa* with scattered *Hakea lorea, Dolichandrone occidentalis, Grevillea pyramidalis* over hummock grassland of *Triodia epactia* (Burrup form) with occasional *Triodia angusta.* The distribution of this vegetation community mapped in 2018/19 is significantly less than Astron 2005, with the surrounding vegetation descriptions in 2018/19 retaining those mapped by Trudgen and Associates 2002.

AiGpTe Tall shrubland of *Acacia inaequilatera* and *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* (Burrup form) over herbland of *Gomphrena cunninghamii, Abutilon lepidum, Trichodesma zeylanicum, Trachymene oleracea*

Astron 2005 Type 2 Low (pocket) woodland of *Terminalia supranitifolia*, *Brachychiton acuminatus*, *Ficus brachypoda* over open low shrubland of *Dichrostachys spicata, Ipomoea costata* over very open grassland of *Cymbopogon ambiguus, Triodia epactia* (Burrup form).

BaAcIc Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea, Scaevola* aff *spinescens, Ipomoea costata* over herbs and very open grassland of *Triodia epactia* (Burrup form) with *Cymbopogon ambiguus* and *Paspalidium clementii*

FbBaTsAc Open low woodland of *Ficus brachypoda, Brachychiton acuminatus, Terminalia supranitifolia* over mixed shrubland of *Acacia coriacea, Scaevola* aff *spinescens, Rhagodia preissii* subsp *obovate* over open *Cymbopogon ambiguus* with *Triodia epactia* (Burrup form). Note, no *Terminalia supranitifolia (P3)* present inside the survey boundary.

FvRpAc Shrubland of *Flueggea virosa* subsp *melanthesoides, Rhagodia preissii* subsp *obovata, Alectryon oleifolius* subsp *oleifolius, Scaevola* aff *spinescens, Acacia coriacea* over very open *Triodia epactia* (Burrup form)

Astron 2005 Type 4 Shrubland of *Acacia inaequilatera/Hakea lorea/Acacia bivensoa* over low shrubland of *Indigofera monophylla/Triumfetta appendiculate* (Burrup form) over hummock grassland of *Triodia epactia* (Burrup form) and *Cymbopogon ambiguus* .

AbHlTe Tall shrubland of *Acacia bivenosa* over open shrubland of *Hakea lorea, Acacia colei* over hummock grassland of *Triodia epactia* (Burrup form) over herbland.

Astron 2005 Samphire Vegetation Group 2 Dwarf Shrubland over Low Open Grassland On slightly elevated sandy silts or fringes of inlet

HhtHil Dwarf open shrubland to heath (varies from 2-10% to 20-40%; <0.5m) of *Tecticornia halocnemoide*s subsp. *tenuis* with *Tecticornia indica* subsp. *leiostachya*.

Hht Open (2%) to dwarf shrubland (10-20%; <0.5m) of *Tecticornia halocnemoide*s subsp. *tenuis* with occasional (2%) *Tecticornia pruinosa, Tecticornia indica* subsp *leiostachya, Trianthema turgidifolia*. Occurs along southern border of inlet, with stony mantle and is interrupted by "fingers" of *Triodia angusta* (Burrup form) grassland.

Astron 1999 Unit 4 Drainage Lines and Gully Floors

4a Low Woodland-Forest B (20-50%) of *Terminalia circumulata* and *E. victrix* with Low Scrub B (10-30%, 1-1.5m) and Open Grassland (10-30%).

APM Detailed survey Vegetation Associations not adequately described by M. E. Trudgen & Associates (2002) and Astron Environmental (1999, 2005):

*Cc*AjTt Tussock grassland of **Cenchrus ciliaris*, herbland of **Aerva javanica* and dwarf open shrubland of *Trianthema turgidifolia* on disturbed land.

Lv Dwarf open shrubland of *Lawrencia viridigrisea* (30-70%; 0.3 m)

TeAtSd (Previously disturbed) Scattered *Acacia trachycarpa* over *Triodia epactia* hummock grassland with *Streptaglossa decurrens* herbfield.

Table 4-6 lists the vegetation associations recorded by APM at the Study Area and compares them to those mapped by M. E. Trudgen & Associates (2002) and Astron Environmental (2005).

Table 4-6: Vegetation Associations Recorded by APM at the Study Area Compared with those Mapped by Astron Environmental (2005) and M. E. Trudgen & Associates (2002).

Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
43	(Te)Sv	(Te)Sv	1999 5a
44	(Te)Sv	Sv	1999 5a
47	(Te)Sv	Sv	1999 5a
61	(Te)Sv	(Te)Sv	HdHhtSv
64	(Te)Sv	(Te)Sv	HdHhtSv
55	(Te)Sv	(Te)Sv	HdHhtSv
105	(Te)Sv	(Te)Sv	AbTtWa
106	(Te)Sv	(Te)Sv	AbTtWa
108	(Te)Sv	(Te)Sv	HdHhtSv
109	(Te)Sv	(Te)Sv	HdHhtSv
125	(Te)Sv	(Te)Sv	AbTtWa
130	(Te)Sv	(Te)Sv	ScWa
161	*Cc*AjTt	D	not mapped
11	*CcTs	*CcTs	1999 6a
27	AbCgTe	AbCgTe	1999 3b
35	AbCgTe	AbCgTe	1999 3a
37	AbCgTe	AbCgTe	1999 3c
133	AbHlCwTe	AbImTe	AbHlCwTe
159	AbHlCwTe	AbImTe	AbHlCwTe
85	AbHlTe	AbCwTe	4b. AbHlTe
54	AbImTe	AbImTe	1999 3b
60	AbImTe	AbIm/TeRm	not mapped
73	AbImTe	AbImTe	1e + dolhet: AbHlCwTe
77	AbImTe	AbImTe	1e + dolhet: AbHlCwTe
78	AbImTe	AbImTe	1e + dolhet: AbHlCwTe
80	AbImTe	AbImTe	1e + dolhet: AbHlCwTe
86	AbImTe	AbImTe	1e + dolhet: AbHlCwTe
87	AbImTe	AbImTe	1e + dolhet: AbHlCwTe
16	AbTa	ItTa/AbTa	AbTa
18	AbTa	ItTa/AbTa	1999 3b
41	AbTa	Sm/*Cc/D	1999 5a
48	AbTa	ItTa/AbTa	AbTa
50	AbTa	ItTa	AbTa
52	AbTa	ItTa	AbTa
45	AbTa	ItTa	AbTa
51	AbTa	AbTa	not mapped
68	AbTa	AbTa	1e + dolhet: AbHlCwTe
69	AbTa	AbTa	1e + dolhet: AbHlCwTe
71	AbTa	AbTa	1e + dolhet: AbHlCwTe
75	AbTa	AbTa	1e + dolhet: AbHlCwTe
112	AbTa	AbTa	1g: AiAbTe
145	AbTa	Sv	AbTa
158	AbTa	AbTa	1999 5a
166	AbTe*Cc	D	not mapped
10	AbTe*Cc	TeTh	1999 6a
12	AbTe*Cc	D	1999 6a/6b
13	AbTe*Cc	D	1999 3a
15	AbTe*Cc	AbWaTe	1999 4b
19	AbTe*Cc	D	1999 3a
40	AbTe*Cc	D	1999 5a
42	AbTe*Cc	*Cc	1999 6b

Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
49	AbTe*Cc	D	
53	AbTe*Cc	D	
136	AbTe*Cc	D	not mapped
129	AbTa	(Te)Sv	AbAeTe
115	AiGpTe	TeRm	AiGpTe
116	AiGpTe	AbImTe	1a/1c
135	AiGpTe	TeRm	AiGpTe
162	AiGpTe	TeAb	not mapped
6	FbBaTsAc	R	1999 1a
14	FbBaTsAc	R	1999 1a
88	BaAcIc	R	not mapped
95	BaAcIc	R	not mapped
122	BaAcIc	R	2a BaAcIc
123	BaAcIc	R	not mapped
124	BaAcIc	R	not mapped
1	FbBaTsAc	R	1999 1a
5	BaAcIc	R	not mapped
156	BaAcIc	TeRm	2a BaAcIc
167	BaAcIc	R	not mapped
168	BaAcIc	R	not mapped
169	BaAcIc	R	not mapped
170	BaAcIc	R	not mapped
171	BaAcIc		not mapped
172	BaAcIc		not mapped
173	BaAcIc		not mapped
179	BaAcIc	D	not mapped
180	BaAcIc	AbImTe	not mapped
181	BaAcIc	AbImTe	not mapped
182	BaAcIc	AbImTe	not mapped
79	ChAbSg	AbImTe	not mapped
81	ChAbSg	ChAbSg	3e: ChDsSgTe
7	ChAbTe	TeTh	1999. 4c
134	ChImTe	TeTh	1999. 4c
38	ChImTe	ChImTe	1999 4b
188	ChImTe	ChImTe	1999 2a
2	ChTh	ChTh	1999 2b
31	Ev*CcTe	Ev*CcTe	1999 3b
36	Ev*CcTe	Ev*CcTe	1999 3a
187	Ev*CcTe	Ev*CcTe	1999 4b
189	Ev*CcTe	Ev*CcTe	1999 4b
97	EvAa	EvAbTa	Not mapped
100	EvAa	EvAa	Not mapped
103	EvAa	EvAa	not mapped
96	EvAbTa	EvAbTa	not mapped
98	EvAbTa	EvAbTa	not mapped
99	EvAbTa	EvAbTa	not mapped
3	EvDsTa	EvDsTa	1999. 4c
26	EvDsTa	EvDsTa	1999 4b
160	19994a	EvAbTa	not mapped
83	FbBaTsAc	R	2c FbBaTsAc
84	FbBaTsAc	R	2c FbBaTsAc
148	FbBaTsAc	R	2a BaAcIc
89	FvRpAc	R	2b FvRpAc
90	FvRpAc	R	2b FvRpAc
32	GpCwTe	GpCwTe	1999 3d
140	Tht	Sam	Hht
141	Tht	Sam	Hht

Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
142	Tht	Sam	Hht
143	Tht	Sam	Hht
144	Tht	Sam	Hht
46	ThtTil	Sv	1999 5a
62	ThtTil	Sam	HhtHil
63	ThtTil	Sam	HhtHil
65	ThtTil	Sam	HhtHil
66	ThtTil	Sam	HhtHil
107	ThtTil	Sam	BMF
110	ThtTil	Sam	HhtHil
76	ThtTil	Sam	HdHhtSv
126	ThtTil	Sam	HdHhtSv
128	ThtTil	Sam	HdHhtSv
131	ThtTil	Sam	HdHhtSv
132	ThtTil	Sam	HdHhtSv
139	ThtTil	Sam	Hht
146	ThtTil	Sm/Sv	1999 5a
147	ThtTil	Sam	1999 5a
186	ThtTil	Mud Flat	Mud Flat
138	Lv	APM new	AbAeTe
9	Roads and Infrastructure	Roads and Infrastructure	Roads and Infrastructure
17	Roads and Infrastructure	Roads and Infrastructure	Roads and Infrastructure
20	Roads and Infrastructure	Hearson Cove Road	Roads and Infrastructure
23	Roads and Infrastructure	Hearson Cove Road	Roads and Infrastructure
28	Roads and Infrastructure	Munjugura NP Road	not mapped
29	Roads and Infrastructure	Munjugura NP Camp area	not mapped
30	Roads and Infrastructure	Ev*CcTe	not maped
39	Roads and Infrastructure	D	1999 5a
34	Roads and Infrastructure	Infrastructure	
56	Roads and Infrastructure	D	not mapped
70	Roads and Infrastructure	Road	
58	Roads and Infrastructure	Pipeline	
67	Roads and Infrastructure	Infrastructure	
72	Roads and Infrastructure	Pipeline	
74	Roads and Infrastructure	Infrastructure pipeline and road	
111	Roads and Infrastructure	Road	
113	Roads and Infrastructure	Road and infrastructure	
149	Roads and Infrastructure	road and pipeline	
150	Roads and Infrastructure	road	
151	Roads and Infrastructure	road	
152	Roads and Infrastructure	road	
153	Roads and Infrastructure	road	
155	Roads and Infrastructure	road	
174	roads and infrastructure	roads and infrastructure	not mapped
176	roads and infrastructure	AbImTe	
177	roads and infrastructure	roads and infrastructure	not mapped
178	roads and infrastructure	roads and infrastructure	not mapped
24	TaTsRm	TaTsRm	1999 3b
25	TcEtSe	TcEtSe	1999 4a
164	Te	TeAb	not mapped
165	Te	TeAb	not mapped
183	Te	AbImTe	not mapped
184	Te	AbImTe	not mapped
185	Te	AbImTe	not mapped
57	TeAb	TeAb	1c: AbTe
59	TeAb	TeAb	1b: TeCa
91	TeAb	TeAb	1c: AbTe

Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
93	TeAb	TeAb	1c: AbTe
94	TeAb	TeAb	1c: AbTe
104	TeAb	TeAb	1a GpAbTe
119	TeAb	TeAb	1b: TeCa
163	TeAb	TeAb	not mapped
101	TeAtSd	D	not mapped
102	TeAtSd	D	not mapped
82	TeCa	TeCa	1b: TeCa
121	TeCa	TeCa	1b: TeCa
120	TeRm	TeRm	1b: TeCa
127	TeRm	TeRm	TeCa
157	TeRm	TeAb	1a GpAbTe
4	TeTh	D	1999 2b
8	TeTh	TeTh	1999 2b
21	TeTh	TeTh	1999 2a
33	TeTh	TeTh	1999 2a
137	TeTh	D	not mapped
92	Tw	Tw	1b
114	TeRm	TeRm	1g: AiAeTe

4.2.5 Conservation Significant Ecological Communities

26 rocky outcrops were identified in the APM survey that constitute the PEC:

- Burrup Peninsula rock pile communities. Priority 1: Pockets of vegetation in rock piles, rock pockets and outcrops. Comprise a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Short-range endemic land snails. Threats: industrial development dust emissions. Weed invasion including **Cenchrus ciliaris* (Buffel Grass) and **Passiflora foetida* (stinking passionflower)

The locations of these are displayed in Figure 4-7. Vegetation associations of conservation significance using the M. E. Trudgen & Associates (2002) classification that occur in the Study Area are listed in Table 4-7.

475500.000000 476000.000000 476500.000000 477000.000000

7719500.000000 7719000.000000 7718500.000000 7718000.000000

Figure 4-7: APM Conservation Significant Flora and Vegetation Communities of the Study Area

Legend

Priority Taxon

- Rhynchosia bungarensis (P4)
- Terminalia supranitifolia (P3)

- Priority Ecological Community: P1 Burrup Peninsula Rock Pile Communities
- Trudgen: Dark Orange 2 to 4 occurences
- Trudgen: Light Orange 5 to 9 occurances
- Trudgen: Red 1 occurrence
- Trudgen: Yellow 10 to 24 occurrences
- *Locally Significant Flora*

N

150 75 0 150 Meters

1 centimeter = 70 meters

Date: 25/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190625_CAR002_Fig4-7 Consig flora and veg coms.mxd

Table 4-7: Vegetation Associations that Occur in the Study Area that May Have Local Conservation Significance according to the Classification System devised by M. E. Trudgen & Associates (2002)

APM 2018 vegetation mapping code	Association Description	M. E. Trudgen & Associates (2002) Significance Rating
TaTsRm	*Triodia angusta* (BF) *Triodia epactia* grassland with *Tephrosia* aff. *supina* (MET 12,375) herbland and *Rhyncosia* cf. *minima* lianes	Red 1 occurrence
AbCgTe	*Acacia bivenosa, Cassia glutinosa* open shrubland to shrubland over *Triodia epactia* (BF), **Cenchrus ciliaris* grassland	Dark Orange 2 to 4 occurrences
ChAbSg	*Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* (Burrup form) hummock grassland	Dark Orange 2 to 4 occurrences
Ev*CcTe	*Eucalyptus victrix* low open woodland to low woodland over (*Pittosporum phylliraeoides* var. *phylliraeoides*, *Rhagodia eremaea* high shrubs to shrubs) over **Cenchrus ciliaris*, *Triodia epactia* (BF) tussock/hummock grassland	Dark Orange 2 to 4 occurrences
EvAa	*Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus, Eriachne tenuiculmis, Triodia angusta* (Burrup form) sedgeland and tussock/hummock grassland	Light Orange 5 to 9 occurrences
AbImTe	*Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* (BF) scattered low shrubs to low open shrubland over *Triodia epactia* (BF) hummock grassland to closed hummock grassland	Light Orange 5 to 9 occurrences
AbTa	*Acacia bivenosa* high open shrubs over *Triodia angusta* (BF) hummock grassland	Light Orange 5 to 9 occurrences
ChImTe	*Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa, Acacia coriaceae* subsp. *coriaceae*) scattered tall shrubs over (*Dichrostachys spicata*) scattered shrubs over *Indigofera monophylla* (BF)	Yellow 10 to 24 occurrences
EvDsTa	*Eucalyptus victrix* scattered low trees to low open woodland over *Dichrostachys spicata,* (*Acacia coriaceae* subsp. *coriaceae*) tall scattered shrubs to low open shrubland over *Triodia angusta* (BF) hummock grassland	Yellow 10 to 24 occurrences
GpCwTe	*Grevillea pyramidalis* subsp. *pyramidalis* open heath over *Corchorus walcottii* scattered low shrubs to low open heath over *Triodia epactia* (BF) hummock grassland	Yellow 10 to 24 occurrences
TcEtSe	*Terminalia circumulata* low woodland over *Eriachne tenuiculmis, Triodia epactia* (BF) grassland/hummock grassland with *Sesbania cannabina* herbland	Yellow 10 to 24 occurrences

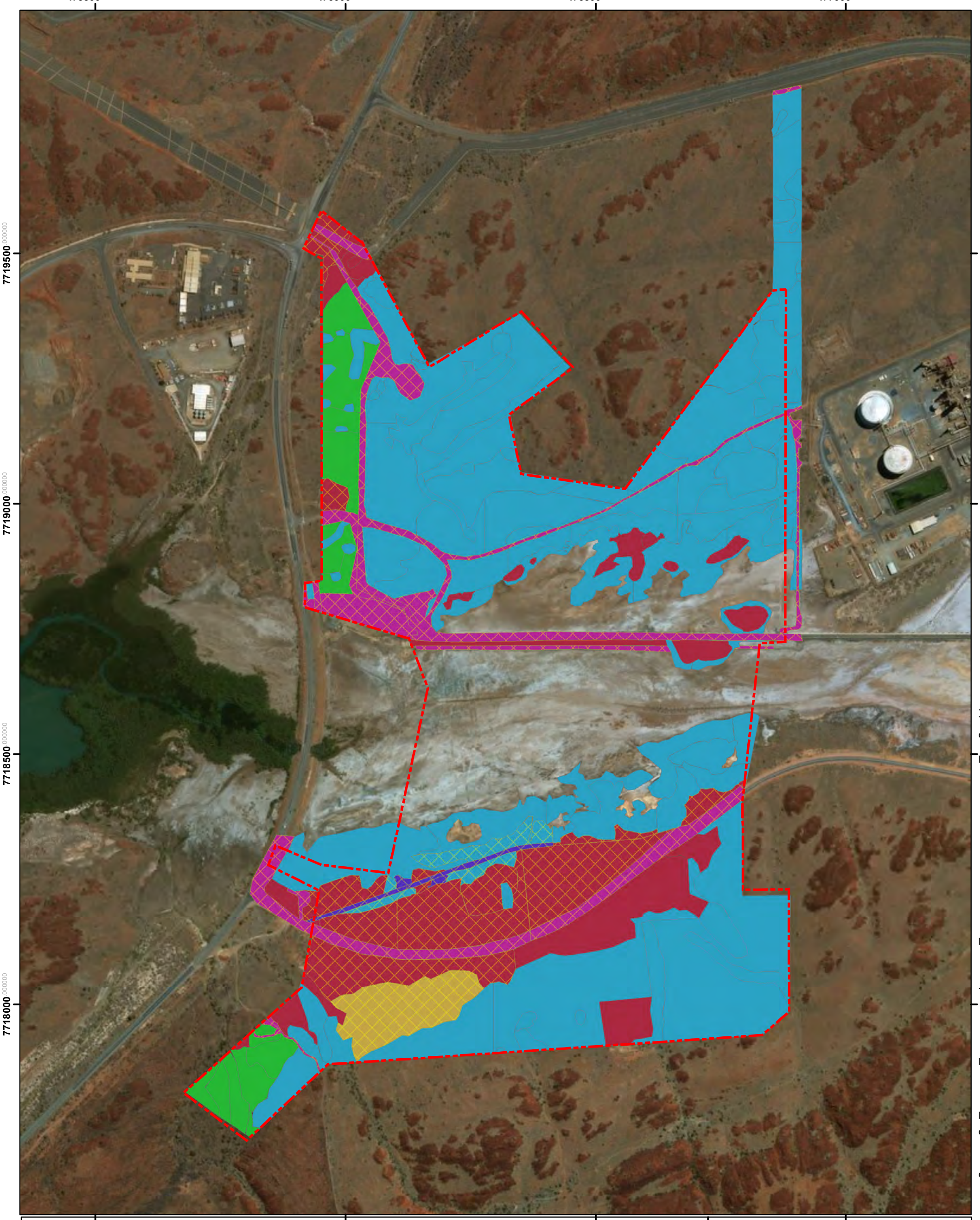
Additionally, the area mapped by APM as AbHlCwTe contains *Dolichandrone occidentalis* (formerly *occidentalis)*. Astron Environmental (2005) notes that this locality is the only known occurrence of *Dolichandrone occidentalis* on the Burrup Peninsula. The densest population areas lie to the north west of the APM mapped area and are not within the Study Area. The density of *Dolichandrone occidentalis* within the APM mapped area is scattered shrubs, whereas in the areas outside of the Study Area the species is a canopy dominant. The species also has a large distribution across the tropical regions to the east and north (Atlas of Living Australia, 2018). The Burrup Peninsula is close to the westernmost distribution of this species. The most western occurrence of the species is in the Barrow Island Class A Reserve (Atlas of Living Australia, 2018).

4.2.6 Vegetation Condition

Vegetation ranges from Excellent condition to Completely Degraded. Vegetation condition is displayed in Figure 4-8. Areas classified as completely degraded contain roads and infrastructure and are maintained in a vegetation free state. One narrow area in the south western part of the Study Area has been classified as Degraded condition. This is a rehabilitated road that has not returned to a good cover or diversity of vegetation.

475500.000000 476000.000000 476500.000000 477000.000000

7719500.000000 7719000.000000 7718500.000000 7718000.000000



Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190625_CAR002_Fig4-8 Vegetation Condition.mxd

Figure 4-8: Vegetation Condition in the Study Area

Legend

Vegetation Condition

- Excellent
- Very Good
- Good
- Poor
- Degraded
- Completely Degraded

Previously disturbed

- Yes

N

150 75 0 150 Meters

1 centimeter = 70 meters

Date: 25/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

The area classified as in Poor condition in the south of the Study Area contains the vegetation association TeTh. This area is previously disturbed and rehabilitated and large shelly lens in close proximity to the surface has been exposed during the rehabilitation process which provides poor quality soil and has slowed the rehabilitation trajectory in this area. Although it has a reasonable abundance of *Triodia epactia* the cover and diversity of plants is lower than would be expected under undisturbed conditions. The time since rehabilitation indicates the area is unlikely to regain pre-disturbance structure without further intervention. There is also a presence of the aggressive weed **Cenchrus ciliaris*.

A number of areas have been designated in Good condition. These are distributed across the Study Area. The large areas to the south surrounding Hearson Cove Road are previously disturbed and rehabilitated and although there is also some poorer quality subsoils present at the surface, there is a reasonable diversity of species and a high abundance of plants in multiple strata. The introduced species **Cenchrus ciliaris* and / or **Aerva javanica* were found in these areas. Smaller areas designated Good condition are generally undisturbed or near to a disturbance (such as a road or pipeline corridor) and have significant infestations of the introduced species **Cenchrus ciliaris*, **Aerva javanica* and **Passiflora foetida.*

Areas in the vegetation fringing the tidal inlet have been classified as Good Condition in par due to the presence of **Cenchrus ciliaris* and **Aerva javanica* but also due to the lower species diversity recorded there than by Astron (2005). Astron (2005) considered changes to the surface flow conditions caused by the pipeline infrastructure to be impacting the health of the vegetation in these areas, and the lower species diversity recorded by APM confirm this.

Areas designated in Very Good condition have vehicle tracks or other infrastructure nearby that are causing some level of disturbance to the continuity of the landscape but are otherwise not disturbed. All other areas are in Excellent condition and displayed no signs of disturbance.

A large amount of dust was noted on the foliage of shrubs and trees across the entire survey area during the dry season. A large number of shrubs were noted to have died in many areas across the Study Area however it is difficult to speculate on the cause of death differing from expected senescence of short-lived perennial shrub species common on the Burrup Peninsula.

4.2.7 Conservation Significant Flora

Two flora of conservation significance were located in the Study Area (Table 4-8). *Rhynchosia bungarensis* is synonymous with *Rhynchosia* sp. Burrup listed as flora of conservation significance by M. E. Trudgen & Associates (2002). Locations of the Priority flora located by APM are shown in Figure 4-7.

Table 4-8: Flora of Conservation Significance Recorded within the Study Area

Species	Conservation Status	Recorded in APM Quadrat(s)	Recorded in APM Targeted Search(es)	No. of Individuals Recorded
Terminalia supranitifolia	P3	3	OC6	4
Rhynchosia bungarensis	P4	40	OC29-1	2

Four *Terminalia supranitifolia* trees were recorded in the Study Area. *Terminalia supranitifolia* is typically found as a low spreading tree on rockpiles on the Burrup Peninsula. Rock pile vegetation communities, of which *Terminalia supranitifolia* is a component, have PEC status. ENV Australia (2006) recorded this species at four sites within the Pluto LNG 'Site B North' study area to the north east of the Study Area. It was found at rockpiles

and drainage lines, with one or "a few" individuals at each site. *Terminalia supranitifolia* has been discovered in scattered populations in the Chichester Ranges, leading to a reclassification from P1 to P3 in 2005.

Rhynchosia bungarensis (P4) was added to the Priority Flora List in 2009. It is reasonably widespread on the Burrup Peninsula although less common than *Rhynchosia minima* (M. E. Trudgen & Associates, 2002). It is frequently found along the more sheltered bases of rockpiles, along gully walls or in more dense vegetation where it is protected. The species occurs as scattered populations within the Pilbara.

Known populations of *Stackhousia clementii* (P3) to the east of the Study Area were visited in the Post Wet-Season survey and healthy individuals located. Extensive searching within suitable habitat of the Study Area did not locate the priority species.

4.2.8 Introduced Flora

Four introduced species were recorded in the Study Area. No Declared weeds or weeds with control categories under the BAM Act were located in the Study Area.

The introduced species **Cenchrus ciliaris* (buffel grass) was scattered across the Study Area with the greatest abundances occurring in previously disturbed areas or in ephemeral creek lines under shady canopies.

**Aerva javanica* (kapok) occurs in highest abundances in the sandy swale areas adjacent to the tidal inlet and in disturbed areas particularly near roads. In undisturbed vegetation its presence is scattered and very low abundance.

**Passiflora foetida* var. *foetida* (stinking passionflower) is restricted to the riparian vegetation in the north west corner of the Study Area. Although the distribution is restricted, where it does occur it has a very aggressive infestation and is likely to cause significant decline to the quality of the vegetation in the near future if not controlled.

**Malvastrum americanum*, a naturalised herbaceous weed occurred as two individuals at one location.

The native species *Acacia ancistrocarpa* and *A. synchronicia* are common in the Pilbara but not common on the Burrup Peninsula. They were recorded as an opportunistic collection near Hearson Cove Road and are likely to have arrived in the area by transport of seed on vehicles (M. E. Trudgen & Associates, 2002).

5 TERRESTRIAL VERTEBRATE FAUNA RESULTS

5.1 DESKTOP SURVEY

Across the four online database searches (AoLA, NatureMap, DBCA, and the EPBC PMST), 214 terrestrial vertebrate fauna were identified as having the potential to occur, including 4 amphibians, 123 birds, 23 mammals, and 64 reptiles. The most extensive species list was the NatureMap database, with 146 species, followed by the AoLA database with 120. The DBCA Database and PMST databases both identified 42 species. An additional 35 species of marine mammals and reptiles were identified but are not further considered.

Worley Astron (2006) conducted a review of previous biological surveys carried out in the immediate vicinity and combined them in one collated database containing 305 species, including 14 non-volant mammals, 18 bats, 4 introduced mammals, 186 birds, 79 reptiles and 4 amphibians. Of these, 221 species were recorded in field surveys, providing an extensive species list, especially with additional online database searches conducted by APM for this study.

In total, 99 conservation significant species were identified across all database searches (Table 5-1). Of these, 98 were from database searches or the Worley Astron (2006) report, and one additional species was recorded during APM surveys that had not been recorded previously. For simplicity, all conservation significant fauna recorded during the APM surveys are also included in Table 5-1, but are discussed in more detail in Section 5.2.6. Refer to Appendix H for a discussion of the likelihood of occurrence of each of the identified conservation significant fauna and their habitat descriptions and requirements. Figure 5-1 shows the locations of conservation significant fauna in the vicinity of the Study Area identified by a DBCA database search.

Table 5-1: Conservation Significant Fauna Identified in the Database Searches and/or Recorded by APM (2018, 2019) or Worley Astron (2006)

Species	Common Name	Cons. Code		Database				Biological Surveys	
		Cth	State	NatureMap (10 km buffer)	AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km 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

[1] Listed as a Marine species under the *EPBC Act* (1999).

[2] Listed as a Migratory species under International Agreement under the *EPBC Act* (1999).

Species	Common Name	Cons. Code		Database			Biological Surveys		
		Cth	State	NatureMap (10 km buffer)	AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km 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	NatureMap (10 km buffer)	AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km 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 Mrtin	M	-	x	x			x	x

Species	Common Name	Cons. Code		Database			Biological Surveys		
		Cth	State	NatureMap (10 km buffer)	AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km 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 (10 km buffer)	AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km 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		

Figure 5-2: Conservation Significant Fauna Identified by Department of Biodiversity Conservation and Attractions Database Search as Occuring in the Vicinity of the Project Area

Legend

<all other values>	Caretta caretta	Gelochelidon nilotica	Numenius minutus	Sterna hirundo
NAME_SCI	Charadrius leschenaultii	Hydromys chrysogaster	Numenius phaeopus	Sternula albifrons
Actitis hypoleucos	Charadrius mongolus	Hydroprogne caspia	Oceanites oceanicus	Sternula nereis nereis
Anous stolidus	Charadrius veredus	Liasis olivaceus barroni	Onychoprion anaethetus	Sula leucogaster
Apus pacificus	Chelonia mydas	Limosa lapponica	Pandion cristatus	Thalasseus bergii
Arenaria interpres	Chlidonias leucopterus	Limosa limosa	Pluvialis fulva	Tringa brevipes
Calidris acuminata	Dasyurus hallucatus	Macroderma gigas	Pluvialis squatarola	Tringa glareola
Calidris alba	Dugong dugon	Megaptera novaeangliae	Pseudomys chapmani	Tringa nebularia
Calidris canutus	Eretmochelys imbricata	Mormopterus (Ozimops) cobourgianus	Puffinus pacificus	Tringa stagnatilis
Calidris ferruginea	Falco peregrinus	Natator depressus	Stenella longirostris	Xenus cinereus
Calidris ruficollis	Fregata ariel	Numenius madagascariensis	Sterna dougallii	

N

0.90.45 0 0.9 Kilometers

1 centimeter = 493 meters

Date: 12/12/2018

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20181212_CAR001_Fig5-3 DBCA Consig fauna.mxd

Of the 99 conservation significant species that have been recorded, or have the potential to occur, 88 are birds, many of which listed as migratory or marine under the EPBC Act. A range of threatened species also have the potential to occur. The Curlew Sandpiper (*Calidris ferruginea*), Great Knot (*Calidris tenuirostris*), and Eastern Curlew (*Numenius madagascariensis*) are all listed as Critically Endangered and have been recorded in previous surveys at neighbouring sites. The Northern Quoll (*Dasyurus hallucatus*) and the Black-footed rock wallaby (*Petrogale lateralis*) are both listed as Endangered and have been recorded in previous surveys in the vicinity. The Pilbara Olive Python (*Liasis olivaceus barroni*) and Ghost Bat (*Macroderma gigas*) are listed as Vulnerable, and while records exists for both species in the database searches, they were not recorded by Worley Astron (2006).

Introduced species identified by database searches as likely or potentially occurring at the Study Area, and / or recorded by Worley Astron (2006) and APM, are listed in Table 5-2.

Table 5-2: Introduced Fauna Identified in the Database Searches and/or Recorded by Worley Astron (2006), and APM (2018, 2019)

Species name	Common Name	Listing		Database				Biological Surveys	
		Cth[3]	State [4]	DBCA (~25 km buffer)	NatureMap (10 km buffer)	AoLA (10 km buffer)	EPBC (5 km buffer)	Worley Astron (2006)	APM
Birds									
Columba livia	Domestic Pigeon	Int.	s11				x		
Passer domesticus	House Sparrow	Int.	s12, C1				x		
Passer montanus	Eurasian Tree Sparrow	Int.	s12, C1				x		
Mammals									
Canis lupis familiaris	Dog	Int.	s22, C3		x			x	x
Equus caballus	Horse	Int.	s22, C3				x		
Felis catus	Cat	Int.	s11		x			x	x
Mus musculus	House Mouse	Int.	s11					x	
Oryctolagus cuniculus	Rabbit	Int.	s22, C3				x		
Rattus rattus	Black Rat	Int.	s11					x	x
Vulpes vulpes	Red Fox	Int.	s22, C3		x			x	
Reptiles									
Hemidactylus frenatus	Asian House Gecko	Int.	s22, C3		x		x		
Ramphotyphlops braminus	Flowerpot Snake	Int.	s22				x		

[3] Listed as Introduced under the *EPBC Act* (1999)

[4] Declared Pest Status (BAM Act, 2007)

5.2 FIELD SURVEY

5.2.1 Survey Conditions

The post-wet season field survey 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 adequate post-wet season survey conditions. The overall sampling effort was assessed by applying a Species Accumulation Curve (Appendix L).

5.2.2 Birds

APM recorded 63 bird species across the pre-wet and post-wet season surveys (Table 5-3). 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 (NB: the total of 186 bird species noted in section 5.1 included records off the Burrup Peninsula but in similar habitat). 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 (H*ydroprogne 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 surveys, and the habitat types the records were made within, are listed in Table 5-3.

Table 5-3: APM Avifauna Survey Records and Associated Habitat Types

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	

Order	Family	Species	Common Name	Mid-slope	Rocky Outcrop	Samphire
		Haliastur indus	Brahminy Kite	x		x
		Haliastur sphenurus	Whistling Kite	x	x	x
		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

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

5.2.3 Mammals

APM recorded 15 mammal species over the two surveys (Table 5-4, Table 5-5); 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 5-4: Records of Non-volant 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	

Table 5-5: 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

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 5-5). 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.

During the 2019 APM survey, Ghost Bats (*Macroderma gigas*) were detected on two nights in rocky outcrop and mid-slope habitats (Table 5-5). 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.

5.2.4 Reptiles and Amphibians

Twenty-eight species of reptiles and amphibians were recorded by APM, all of which during the post wet-season trapping survey (Table 5-6). 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.

Table 5-6. 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			Total
		Camera	Opp.	Elliot	Funnel	Pit	Mid-slope	Rocky Outcrop	Samphire	
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
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

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 5-6). 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.

475500.000000 476000.000000 476500.000000 477000.000000

7719500.000000 7719000.000000 7718500.000000 7718000.000000

RSC03
RS02
CAR006
RSC02
RSC01
RS05
RS01
RS08
CAR004
CAR005
RS06
RS07
RS12
CAR003
CAR001
RS04
RS10
RS11
CAR002
RS03
RS09
RSC06
RSC05
RSC04

Document Path: \\MAINSERVER\Documents\APM GIS and Mapping\03_Client\APM2018-19GIS\CAR\02_GIS Maps\20190611_CAR002_Fig5-2 Fauna habitat data points.mxd

Figure 5-2: Fauna Habitats and Fauna Data Collection Points of the Study Area

Legend

Study Area

Survey Type
- Bat Detector
- Camera Trap
- Snail survey
- Trapping Grid

Fauna_habitat
- Disturbed
- Drainage
- Hummock Grassland on Midslopes
- Rocky Outcrops
- Samphire Shrublands/Supra-tidal Flats

N

150 75 0 150 Meters

1 centimeter = 70 meters

Date: 11/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au

5.2.5 Fauna Habitats

Four fauna habitats were present within the Study Area: rocky outcrops, Hummock Grasslands on Mid-slopes, Samphire Shrublands/Saltplains, and Drainage Lines. Habitats and fauna data collection sites are shown in Figure 5-2.

Rocky Outcrops

Plate 5-1: Rocky Outcrop Habitat Trapping Sites

Characteristic of the Burrup Peninsula, the formation of Proterozoic igneous rock outcrops (Gidley Granophyre) within the Study Area, weathered over time and resistant to extensive erosion, produce aggregates of split boulder screes. The structural complexity of these landforms provides cover for reptiles and small terrestrial mammals, while caves may provide roosts for bats. The most common rocky outcrop species in the APM surveys were the Spotted Dtella (*G. punctata*), Lined Firetail Skink (*Morethia ruficauda exquisita*), and Pygmy Python (*Antaresia perthensis*). In addition, the four most commonly recorded bat species were all most frequent in the rocky outcrop habitat; Northern Coastal Free-tailed Bat (*M. cobourgianus*), Little Broad-nosed Bat (*S. greyii*), Common Sheath-tailed Bat (*T. georgianus*), and Finlaysons's Cave Bat (*V. finlayson's*). Echidna (*T. aculeatus*) scats were also frequently recorded on rockpiles within the Study Area. This habitat type is also suitable for the Pilbara Olive Python (*Liasis olivaceus barroni*), and though not recorded during APM surveys or previous adjacent surveys (Worley Astron 2006), it is likely this species will occur in the area.

This habitat type supports many of the conservation significant species that occur on the Burrup Peninsula, and is therefore of high importance. The Study Area contains some rocky outcrop areas (Figure 5-2). This habitat type is more abundant and of higher quality, however, in the areas immediately adjacent to the Study Area. Where possible, development of the Study Area should avoid disturbance of rocky outcrops.

Hummock Grasslands on Mid-slopes

Plate 5-2: Hummock Grasslands on Mid-slope Trapping Sites

The Study 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*. The presence of hummock grasses and relatively deep soils within this habitat type provides important shelter for a range of small species such as Main's Frog (*C. maini*), Leonhard's Ctenotus (*Ctenotus leonhardii*) and the Western Bearded Dragon (*Pogona minor mitchelli*), as well as larger snake species, such as the Western Brown Snake (*Pseudonaja mengdeni*).

This habitat type will also provide foraging habitat for grazers; primarily Euros (*O. robustus*). These grasslands are also likely to support small rodents such as the Delicate Mouse (*Pseudomys delicatulus*), Sandy Inland Mouse (*P. hermannsburgensis*), and Desert Mouse (*P. desertor*) (Van Dyck & Strahan, 2008). While no rodents were recorded in the Mid-slope habitat during the 2019 APM survey, the low capture rate of small mammals in that survey suggests that these species were not present in high numbers at the time, possibly due to the dry conditions, and as a result did not occupy the full extent of potential habitat.

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 is typical of the broader Pilbara region, but less common on the Burrup Peninsula, which is frequently dominated by rocky outcrops. This habitat type is well represented within the Study Area, and is likely to support fewer conservation significant species, and be less sensitive to disturbance, than other habitat types present.

Samphire Shrubland / Supra-tidal Flats

Plate 5-3: Samphire Shrubland / Supra-tidal Flat Trapping Sites

The Burrup Peninsula contains marine alluvial flats and river deltas that support Samphire and mangal ecosystems (mangroves). Although these areas are relatively small in a regional context, the intertidal flats around the Burrup are locally significant (DEC, 2013). Within the Study Area, supra-tidal flats exist in the middle of the area, draining westward into King Bay, and this area is fringed by Samphire Shrubland, consisting of low shrublands on sandy soils. The reptiles recorded most frequently within this habitat type were the Ring-tailed Dragon (*Ctenophorus caudicinctus*), Northern Bar-lipped Skink (*Eremiascincus isolepis*), and Bynoe's Gecko (*Heteronotia binoei*). The Delicate Mouse (*P. delicatulus*), Desert Mouse (*P. desertor*), Greater Northern Free-tailed Bat (*Chaerephon jobensis*), and Gould's Wattled Bat (*Chalinolobus gouldii*) were all recorded within the Samphire Shrubland habitat type more frequently than other habitat types.

The supra-tidal flats area of this habitat type is subject to inundation, due to tidal surges, and also drainage from rainfall events. As such, this area supports a range of shorebirds and waders, including the Red-capped Plover (*Charadrius ruficapillus*), Grey-tailed tattler (*Tringa brevipes*), and Common Greenshank (*T. nebularia*), all of which were recorded frequently in the post wet-season survey. In turn, predatory species such as the Eastern Osprey (*Pandion haliaetus*) are likely to forage over these areas.

Plate 5-4: Examples of Mangrove Vegetation Adjacent to the Study Area, and Supra-tidal Habitat Present within the Study Area

Mangrove vegetation is present in association with King Bay, immediately outside the survey area to the West. These areas are likely to support a diverse range of fauna including many birds that may use the rich organic

marine sediment to forage and potentially nest, such as Brahminy Kite (*Haliastur indus*) and the Mangrove Golden Whistler (*Pachycephala melanura*). Mangrove vegetation may also support a range of mammal species, including the Rakali (*Hydromys chrysogaster*), Northern Coastal Free-tailed Bat (*O. cobourgianus*), and the Little Red Flying Fox (*Pteropus scapulatus*). The mangrove vegetation is outside the Study Area, and will not be directly disturbed by the proposed development.

The Samphire Shrubland / Supra-tidal Flats habitat type provides locally important foraging opportunities for a range of species, particularly migratory shorebirds and waders. Shallow tidal plains such as that within the Study Area are rare on the Burrup Peninsula. Where possible, development within the Study Area should avoid disturbance of this habitat type, and modification of any drainage that would alter the habitat, or the mangroves further downstream.

Drainage Lines

Plate 5-5: Drainage Line Habitat in the Southwest Corner of the Study Area

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 Study Area in the southwest corner is quite significant as this habitat type occurs infrequently on the Burrup Peninsula.

Throughout much of arid and semi-arid Australia, ephemeral drainage lines provide important habitat diversity and resources (i.e. water) for many species. Within the Study Area, Drainage Lines are likely to provide important habitat for reptiles, such as Pygmy Pythons (*A. perthensis*) and Yellow Spotted Monitors (*Varanus panoptes*). The large trees associated with these landforms may provide hollows suitable for birds such as the Galah (*Cacatua roseicapilla*) and Little Corella (*Cacatua sanguinea*). Similarly, this habitat provides roosting, nesting,

perching and foraging habitat for the Red-browed Pardalote (*Pardalotus rubricatus*), Red-backed Kingfisher (*Todiramphus pyrrhopygius*) and Black-faced Woodswallow (*Artamus cinereus*).

Trees containing hollows are likely to provide roosting habitat for the Northern Free-tailed Bat (*Chaerephon jobensis*), the Little Broad-nosed Bat (*S. greyii*), as well as foraging habitat for the Ghost bat (*M. gigas*).

Drainage line habitat is relatively limited within the Study Area, and is likely to be of high importance due to the associated tall trees and ephemeral freshwater. Particularly, the creekline in the south-west of the Study Area is unique within the Study Area. This creek line drains from the Murujuga National Park, an area likely to contain suitable roost sites for the Ghost Bat (*M. gigas*), which forages along drainage lines. Development of the Study Area should avoid disturbance to this habitat type.

5.2.6 Conservation Significant Fauna

A range of conservation significant fauna have the potential to occur at the site (Table 5-1). Of these 99 species, 28 have been recorded by APM within the Study Area (Table 5-7). 26 are Migratory or Marine birds, and many share common habitat preferences. These species are discussed in more detail below.

Two conservation significant mammal species were recorded during APM surveys, both of which are bats; the Ghost Bat (*M. gigas*), and the Northern Coastal Free-tailed Bat (*M. cobourgianus*). No conservation significant reptiles or amphibians were identified during the surveys. The Northern Quoll (*D. hallucatus*) and the Pilbara Olive Python (*Liasis olivaceus barroni*) were not recorded by APM, but have the potential to occur, and are important considerations for many developments in the Pilbara region.

Table 5-7: Conservation Significant Fauna recorded by APM, Showing the Number of Bird Individuals observed and the Number of Nights each Bat Species was Recorded

Species	Common Name	Conservation Status		APM Biological Surveys	
		Cth	State	2018 Pre-wet Season	2019 Post-wet Season
Birds					
Accipiter fasciatus	Brown Goshawk	M	-		1
Anthus novaeseelandiae	Australasian pipit	M	-	1	19
Cacomantis pallidus	Pallid Cuckoo	M	-		7
Calidris ruficollis	Red-necked stint	IA, M	IA, Schedule 5	1	
Chalcites osculans	Black-eared Cuckoo	M	-		7
Charadrius ruficapillus	Red-capped Plover	M	-	18	89
Chlidonias hybrida	Whiskered tern	M	-		21
Chroicocephalus novaehollandiae	Silver Gull	M	-	2	1
Coracina novaehollandiae	Black-faced Cuckoo-shrike	M	-	27	15
Egretta garzetta	Little Egret	M	-	2	18
Falco cenchroides	Nankeen Kestrel	M	-	11	17
Grallina cyanoleuca	Magpie-lark	M	-		4
Haliaeetus leucogaster	White-bellied Sea-Eagle	M	-		1
Haliastur indus	Brahminy Kite	M	-	4	1
Haliastur sphenurus	Whistling Kite	M	-	16	5
Himantopus himamtopus	Black-winged Stilt	M	-		13
Hirundo neoxena	Welcome Swallow	M	-		8
Hydroprogne caspia	Caspian Tern	IA	IA, Schedule 5		1
Merops ornatus	Rainbow Bee-eater	M	-	8	
Numenius phaeopus	Whimbrel	IA	IA, Schedule 5		5
Pandion cristatus	Eastern Osprey	IA, M	IA, Schedule 5	2	
Petrochelidon nigricans	Tree Martin	M	-		8

Species	Common Name	Conservation Status		APM Biological Surveys	
		Cth	State	2018 Pre-wet Season	2019 Post-wet Season
Pluvialis fulva	Pacific golden plover	IA, M	IA, Schedule 5		1
Thalasseus bengalensis	Lesser Crested Tern	M	-	1	
Tringa brevipes	Grey-tailed Tattler	IA	IA, Schedule 5, P4		57
Tringa nebularia	Common Greenshank	IA, M	IA, Schedule 5		37
Mammals					
Macroderma gigas	Ghost Bat	VU	VU, Schedule 3		2
Mormopterus cobourgianus	Northern Coastal Free-tailed Bat	-	P1	6	21

5.2.6.1 Migratory and Marine Birds

Of the 26 conservation significant species observed by APM during both surveys, 23 are listed as Marine and 7 are listed as Migratory (a species can be listed as both Marine and Migratory) and are covered under international agreements. None of the species present are listed as Threatened species (under federal or state legislation). The Grey-tailed Tattler (*Tringa brevipes*) is listed as Priority 4 under the BC Act, which means it is Rare or Near Threatened, but not qualifying of listing as Threatened.

The Study Area contains a broad salt plain, draining westwards towards King Bay, with some associated Mangrove vegetation outside the Study Area. As a result, the Study Area provides an important and relatively limited area suitable for migratory waders and shorebirds. Under the guidelines outlined by DoEE (2017), the area does not qualify as Nationally Important Habitat, as there are fewer than 15 migratory species, and less than 2,000 migratory shorebirds that regularly use the area. The Burrup Road, a busy road providing access to the many processing facilities and Port, is situated immediately to the west of the supra-tidal flats. As a result, this area is already subject to noise disturbance from traffic, and the species observed during APM surveys are present despite this disturbance. While further disturbance to this area should be minimised, it is unlikely to present a significant increase to that already created by the Burrup Road.

5.2.6.2 Ghost Bat – *Macroderma gigas*

The Ghost Bat is the largest microchiropteran bat in Australia and the second largest in the world (*Woinarski et al*. 2014; Richards *et al*. 2008). It is the only carnivorous bat in Australia (Michael & Lindenmayer, 2018) and the sole residing member of the family Megadermatidae (False Vampires) in Australia and is endemic to the continent (Woinarski *et al.* 2014; Richards *et al.* 2008). Originally widespread across mainland Australia, the species has experienced a range contraction, and now only persists in in the Pilbara and Kimberley regions and patchily along coastal Queensland and the northern extent of the Northern Territory (Michael and Lindenmayer, 2018; BHP, 2017; Woinarski *et al.* 2008).

The suitability of roost sites is the most influential and limiting factor for the distribution of these bats (BHP, 2017). While ghost bats have exploited abandoned mine shafts and underground pits and found these types of roost sites to be favourable, this species is particularly sensitive to disturbance and is unlikely to return to a site once it has been disturbed in any way (Michael and Lindenmayer, 2018; BHP, 2017; Woinarski *et al.* 2014).

While it is daytime, they roost in deep, complex natural cave systems and rock fissures with stable temperatures of 23°–28° and a relative humidity of 50-100% (Woinarski *et al.* 2014). Approximately 1 hour after sunset the bats will emerge from their roosts and commence hunting for a period of 2 hours (BHP, 2017). The Ghost Bat uses a surface foraging strategy in which it will perch on vegetation with vantage points to either ambush passing prey on the ground or in the air, or it will glean prey from the ground whilst in flight (Woinarski *et al.* 2014). Bats change viewpoints frequently during foraging activity and may move up to 360 metres between viewpoints

(Woinarski *et al.* 2014). Ghost Bats have an average foraging area of 61 ha, with individuals typically ranging as far out as 1.9 kilometres from their day roosts (Woinarski *et al.* 2014). This species is Australia's only truly carnivorous bat, preying on frogs, birds, mice, small lizards, insects and other bats (Michael and Lindenmayer, 2018; Woinarski *et al.* 2014). Ghost Bats typically fly low to the ground, around fence height, and are prone to collisions with wire fences. Due to low fecundity, even infrequent deaths on fences can have a moderate impact on populations (Woinarski *et al.* 2014).

Upon the commencement of mating season in July, Ghost Bats will concentrate upon relatively few roost sites. The gestation period takes three months from which the offspring are born during September to November. Juveniles hunt with their mothers until they become completely independent. Colony sizes range from a few individuals to greater than 100, although large colonies are now rare. In the Pilbara, colony sizes in natural roosts are generally much smaller, often consisting of just a few animals. It is during the time of breeding and rearing young that these bats are most sensitive to disturbance.

No suitable roosting caves were located within the Study Area during APM surveys, although Ghost Bats were detected on two occasions on the south side of the Study Area in close proximity to rocky outcrops. The creekline in the southwest of the Study Area contained large trees and is in close proximity to the rocky outcrops of Murujuga National Park, where roosting habitat may be present. Given the provision of tall trees as vantage points and the proximity to potential roosting habitat, this creekline is considered important Ghost Bat habitat.

5.2.6.3 Northern Coastal Free-tailed Bat - *Mormopterus cobourgianus*

The Northern Coastal Free-tailed Bat is listed as Priority 1 under the BC Act as it is a relatively little-known species. There are few published studies on this species, with most relying on general information about the Genus, or field guides. This species occurs in coastal areas of the Pilbara region in WA, and the Top End of the Northern Territory (Churchill, 2008). The Northern Coastal Free-tailed Bat is brown to grey-brown, with a paler belly that is greyish lemon. They roost in the upper dead branches of the Grey Mangrove (*Avicennia marina*), emerging in groups of up to 100 after sunset and dispersing to forage in pairs or alone (Churchill, 2008).

The Northern Coastal Free-tailed Bat generally forages in mangroves and associated monsoon forests and is known to use openings and linear clearings (such as roads or creeks) to navigate through the canopy (Churchill, 2008). Within the Study Area, this species was recorded throughout all habitats, and on many occasions. It is likely that this species may roost in the mangrove vegetation to the west of the Study Area.

5.2.6.4 Northern Quoll – *Dasyurus hallucatus*

The Northern Quoll is considered Endangered under both Commonwealth and State legislation. In addition to its conservation significance, the species is considered a keystone species in the Pilbara, and one of many 'critical-weight range' mammals under threat across Australia.

Northern Quolls are nocturnal, partially arboreal and omnivorous, primarily feeding on invertebrates, small mammals and reptiles (Schmitt *et al*. 1989). Once thought to have occupied almost the entire northern third of Australia, the distribution of Northern Quolls is suspected to have declined by over 75% (Braithwaite & Griffiths, 1994). The Northern Quoll is generally found in rocky and broken country within open Eucalypt forest, however is can occupy a variety of other habitats, including rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. The Northern Quoll will usually den in hollow tree trunks (Hill & Ward, 2010) or in small caves and crevices in rocky outcrops. These areas can be found within deep drainage lines, steep hills and gorges on the island. Management of the Burrup Peninsula population of Northern Quoll is critical to maintain the mainland distribution. Researchers at DBCA have been strongly advising that predator control on the Burrup be increased in order to return the Peninsula to similar densities to that of the neighbouring islands. However, the number of stakeholders involved in in such management makes progress slow. Aerial deployment of predator baits have recently been conducted across the Burrup Peninsula (Department of Parks and Wildlife, 2017).

Northern Quoll have been recorded in close proximity to the Study Area. One record in 1990 is less than 1 km from the proposed site, and another at a similar time is approximately 2.2km away. The most recent record is from the northern point of King Bay which is approximately 2.7 km from the proposed site. Despite a concerted survey effort by APM during the 2018 and 2019 surveys, including cage and Elliot trapping, camera trapping, spotlight searches, and scat searches, Northern Quolls were not recorded. Given the low density of mainland populations of this species, and its cryptic nature, the lack of detections during APM surveys may not indicate the absence of this species from the area. However, the lack of detections does indicate that this species is rare in habitats at the Study Area.

Northern Quolls on the Burrup Peninsula are likely to inhabit complex landforms of rocky outcrops, which can afford greater cover from predators that more open areas. The current survey area does not include the well-developed and extensive rocky outcrops present immediately north and south of the site.

5.2.6.5 Pilbara Olive Python – *Liasis olivaceus barroni*

The Olive Python is endemic to Australia and only occurs within two distinct regions, giving rise to two distinct subspecies; *Liasis olivaceus olivaceus* which occurs from the Kimberley region to the Great Dividing Range in Queensland, and the Pilbara Olive Python (*Liasis olivaceus barroni*), largely restricted to the Hamersley Range and Dampier Archipelago of the Pilbara region. Other populations of the subspecies have also been recorded in Pannawonica, Tom Price, Millstream and also the Burrup Peninsula (Pearson, 2006).

The Pilbara Olive Python has been recorded in areas with gorges, escarpments in close proximity to water holes (Doughty *et al.* 2011). During the cooler months they will typically hide in caves, crevices and fissures away from water sources. However, in the warmer months they become active and tend to stay near rocky outcrops and water. Their preference for water holes is likely due to resulting abundance of prey, rather than a need for drinking water. This species readily swims in water holes to hunt prey. On the Burrup Peninsula, Olive Pythons have been found to prefer granophyre rock piles and occasionally are found in neighbouring spinifex grasslands.

The Breeding season commences from June through to August. The mating pair will isolate themselves in shelter for up to three weeks. The eggs are deposited around October after a gestation period of 3 months and hatch in January, after which the young disperse.

Introduced predators represent the main threats to the Pilbara Olive Python. Foxes and cats will prey upon juvenile pythons and compete with adults for prey (Carwardine *et al.* 2014). Within isolated areas, such as the Burrup Peninsula, development of mining infrastructure may also have adverse impacts on the Pilbara Olive Python. Further, mining development could alter the availability of prey and increase road deaths of this species.

Rocky outcrop areas inside and immediately adjacent to the Study Area were nocturnally searched during both APM surveys; no Pilbara Olive Pythons, however, were recorded. While the rainfall leading up to the 2019 post-wet season survey was below average, the cyclone event in the preceding week resulted in some fresh water being available. The frequency with which Pygmy Pythons (*Anteresia perthensis*) were detected during the post-wet season survey (5 individuals across 4 nights) suggested that conditions were appropriate for other python species during this survey.

This species is highly cryptic, and occupies complex rocky outcrops and fissures that make detection probability for this species low. As such, it is possible that Pilbara Olive Pythons will use the Study Area. The lack of detections during the APM survey, however, suggest it is infrequent if present. The current survey area does not include the well-developed and extensive rocky outcrops present immediately north and south of the site.

6 CONCLUSION

6.1 VEGETATION OF CONSERVATION SIGNIFICANCE IN THE STUDY AREA

Twenty-six locations in the Study Area have been classified by this assessment as the P1 Priority Ecological Community – Rockpiles of the Burrup Peninsula. These locations are not presently listed on the DBCA database.

Seven vegetation associations have been classified in this assessment to be synonymous with vegetation associations listed by M. E Trudgen & Associates (2002) as being of conservation significance because they have less than 10 occurrences across the Burrup Peninsula and Angel, Gidley and Dolphin Islands. A further 4 have been included as they were listed with 10 to 24 occurrences. Impact assessment on these vegetation types will need to consider the cumulative impact of prior developments.

The EPA (2001) noted that vegetation in the King Bay – Hearson Cove Valley has high conservation value and that part of the floristic variation appears to be uncommon elsewhere on the Peninsula (Trudgen *et al*., 2001). The EPA (2001) stated that the King Bay – Hearson Cove valley appeared to be the only area on the Peninsula and islands where there is development of both an infrequently submerged littoral zone, an extensive area of samphires, and the littoral grass *Sporobolus virginicus*. It considered that more comparative information was required for the valley vegetation, and that subsequent development needed to incorporate the findings from such work into its planning. Astron Environmental (2005) mapped samphire vegetation in the valley, allowing a more detailed impact and cumulative impact assessment. Outback Ecology (2009) noted that the community mapped as Sm and described as Saline Inlet and Supra-tidal Flats by M. E. Trudgen & Associates (2002) had approximately 56% of this community's extent represented within the proposed Burrup Peninsula Conservation Reserve. Although not classified to the vegetation association level, M. E. Trudgen & Associates (2002) mapped 50 to 99 occurrences of Sm and 25 to 49 occurrences of the littoral grass *Sporobolus virginicus.*

The EPA (2001) noted that the valley is the only broad valley with gentle lower slopes and consequently had the best stands of a part of the range of vegetation structural / dominance units on the Burrup Peninsula (Trudgen, 2001). The Burrup Nitrates project along with other industrial developments in the valley have directly impacted vegetation assemblages considered significant and in general have fragmented the catena / topographic sequence on the northern side of the valley. However, the EPA recognises that the Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) set aside about 5,400 ha (62%) of the Burrup Peninsula for conservation, recreation and heritage protection, and that the valley has been set aside for industrial development. The EPA (2001) expects proponents to take reasonable measures to minimise impacts on the vegetation communities of highest importance as defined at a local and regional scale, having taken the available information on vegetation surveys into account when planning the footprint of their plants.

6.2 FLORA OF CONSERVATION SIGNIFICANCE IN THE STUDY AREA

Four flora of conservation significance occur inside the Study Area. Three *Terminalia supranitifolia* (P3) trees occur on rockpile vegetation in the south of the Study Area which are also classified as the P1 PEC - Rockpiles of the Burrup Peninsula. One specimen of *R. bungarensis* (P4) was collected from near the eastern boundary in a shallow drainage area. *T. supranitifolia* is found in other areas on the Burrup Peninsula, and other areas of the Pilbara, while *R. bungarensis* is widespread throughout the Burrup Peninsula. As such, development of the Study Area does not represent a significant loss of either of these species.

6.3 IMPACTS ON FLORA AND VEGETATION

The proposed Project Area as displayed in Figure ES-1 has been laid out to minimise the impact to conservation significant flora and vegetation whilst simultaneously considering the impact to fauna and heritage.

No Priority flora located during the field surveys will be impacted by the proposed layout. *Dolichandrone occidentalis* has been identified previously as being of local conservation significance as the distribution on the Burrup Peninsula is limited to one known area, despite it being widespread on the mainland. The Project Area intersects with small pockets of this species; however the greater part of its distribution is to the north of the Study Area and will not be impacted.

Three small rock outcrops that constitute the Priority 1 ecological community Rockpiles of the Burrup Peninsula are partially intersected by and will be impacted by the proposed layout. They contain the vegetation community BaAcIc: Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea*, *Scaevola spinescens*, *Ipomoea costata* over herbs and very open grassland of *Triodia epactia* with *Cymbopogon ambiguus* and *Paspalidium clementii*. The Project Area intersects with 0.031 ha of BaAcIc. There are 21 Priority 1 ecological community Rockpiles of the Burrup Peninsula with the vegetation community BaAcIc in the Study Area ranging in size from 0.013 ha to 0.312 ha. In total the BaAcIc in the Study Area covers 1.656 ha and the impact of 0.031 ha will reduce that cover by 1.9%. The total cover of all Priority 1 ecological community Rockpiles of the Burrup Peninsula in the Study Area is 1.876 ha and the impact of 0.031 ha will reduce that cover by 1.7%. It is also noted that there are large, undisturbed areas of the Priority 1 ecological community Rockpiles of the Burrup Peninsula to the north and south of the Study Area, with a large proportion of the total area on the Burrup Peninsula occurring in Reserve areas. As such the proposed impact is not considered to have a significant effect on the overall sustainability of this vegetation type.

The Project Area intersects a number of vegetation associations identified in Trudgen and Associates (2002) as being of regional conservation significance. The area mapped as TaTsRm: *Triodia angusta*, *Triodia epactia* grassland with *Tephrosia supina* herbland and *Rhyncosia minima* lianes by Trudgen and Associates (2002) was recorded as a single occurrence and thus of high conservation significance. In this Biological Assessment, APM have retained the description given by Trudgen and Associates (2002) but note a much lower abundance of *Tephrosia supina* herbland and *Rhyncosia minima* lianes, likely due to the lower than average rainfall conditions. APM also note that this area is a very narrow (15 m wide) strip of area (both in 2002 and 2019) immediately adjacent to the disturbed and rehabilitated zones to the east. In the Cluster analysis, the site was grouped with other sites based on the presence of *Triodia angusta*, and in the present study this locality is one of the furthest occurrence of *T. angusta* from the inlet. The Project Area intersects 0.024 ha of this mapped vegetation association, or 10% of the total mapped 0.224 ha. Notably, where the Project Area intersects the vegetation association does not contain *T. angusta*, as the majority of the *T. angusta* occurs towards the centre of the mapped distribution.

The Project Area also intersects 0.405 ha (40% of the 1.015 ha in the Study Area) of the vegetation association described by Trudgen and Associates (2002) as ChAbSg *Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* hummock grassland. In the current study APM have retained the description. Trudgen and Associates (2002) recorded 4 occurrences of this vegetation association, including one within the Reserved area, and identify it as regionally significant.

The Project Area also intersects three vegetation associations that were recorded by Trudgen and Associates (2002) as having 5 to 9 occurrences. 5.353 ha (65% of the 8.279 ha in the Study Area) of the vegetation association as AbImTe: *Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* scattered low shrubs to low open shrubland over *Triodia epactia* hummock grassland to closed hummock grassland; 3.143 ha (37% of the 8.486 ha in the Study Area) of the vegetation AbTa: *Acacia bivenosa* high open shrubs over *Triodia angusta* hummock grassland and 0.018 ha (8% of the 0.232 ha in the Study Area) of the vegetation association EvAa: *Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus, Eriachne tenuiculmis, Triodia angusta* sedgeland and tussock/hummock grassland.

The southwestern corner of the Study Area contains a number of vegetation associations regional conservation significance with between 2 and 10 occurrences. The area is a drainage feature and has a high diversity of flora and vegetation associations in a small area. This locality is of local conservation significance due to this localised diversity. The Project layout has been achieved so that this area will not be directly impacted by the Project.

The Project impact to the vegetation fringing the tidal inlet is restricted to the northern sector, where the vegetation is contained within the pipeline that runs from the north of the Study Area on the western side, then crosses the mudflat. Astron (2005) note that this pipeline interrupts the flow of water in the area and was at that time having a negative impact on the health of the vegetation. In this current biological survey APM recorded lower floristic and vegetative diversity in this area than Astron (2005). This is potentially a longer-term consequence of the disruption to water flows described by Astron (2005). In this current survey for the area within the Project layout, APM have retained the description of the sandy swale vegetation consistent with Trudgen and Associates (2002) who mapped over 100 occurrences of the association (Te)Sv; and retained the samphire description of Astron (2005) (updated to current nomenclature) ThtTil. Astron (2005) considered the condition of this vegetation to be impacted by the drainage issues of existing infrastructure to the extent that the proposed project at that time was unlikely to have significant further impact.

6.4 IMPACTS ON FAUNA OF CONSERVATION SIGNIFICANCE

In total, APM recorded 63 bird, 7 non-volant mammal, 8 bat, 27 reptile and 1 amphibian species during two surveys. Within this assemblage, one Threatened fauna species, the Ghost Bat (*M. gigas*), one Priority 4 species, the Northern Coastal Free-tailed Bat (*M. cobourgianus*), and 26 listed bird species were recorded.

Of the migratory and marine bird species recorded within the Study Area, the most numerous species were the Red-capped Plover (*C. ruficapillus*), Grey-tailed Tattler (*T. brevipes*), and Common Greenshank (*T. nebularia*). While the supra-tidal flats in the Study Area represent a locally important habitat type for migratory shorebirds, its importance on a regional scale is low. For example, an average of 19,800 Red-necked Stints (*C. ruficollis*) seasonally feed in Roebuck Bay (DoEE, 2018) where only one was recorded during the APM surveys. As such, the Study Area is not likely to be of key importance to migratory species. In addition, the area is already subject to disturbance from the busy Burrup road, and as a result any species that currently use the areas are likely to be relatively resilient to anthropogenic disturbance. The current design of the development within the Study Area largely avoids any disturbance to the supra-tidal flats or the surrounding Samphire Shrublands. As there is infrastructure being built on both the north and south sides of the supra-tidal flats, there will be a road across the supra-tidal flats to connect the two areas. This road has been designed with culverts to avoid restricting drainage. This will negate the potential for development to impact this supra-tidal flats habitat or the mangrove vegetation outside the Study Area.

A range of other bird species were recorded, especially in the post-wet season survey in March 2019, including 11 species of raptor. However, no threatened bird species were recorded during surveys. The Grey-tailed Tattler is a Priority 4 species, meaning it is considered near-threatened under the Western Australian state legislation. The lack of threatened bird species using the Study Area indicates that the proposed development is unlikely to reduce the availability of habitat for such species.

The Ghost Bat (*M. gigas*), listed as Vulnerable under both federal and state legislation, was recorded on two evenings in the southern section of the Study Area. This species requires well developed caves for roosting, and disturbance of these caves is one of the primary drivers of this species' decline. This species often forages along creeklines, using the taller trees as vantage points from which to spot prey. The creekline in the south west of the Study Area is likely to provide important foraging habitat for the Ghost Bat, especially given its close proximity to Murujuga National Park, which is likely to provide important roosting opportunities. Where

possible, development of the Study Area should avoid disturbance of this creekline, to avoid possible impacts to this species.

The Northern Coastal Free-tailed Bat (*M. cobourgianus*), listed as Priority 4 (poorly-known) in WA, was also recorded at numerous sites, on multiple occasions, throughout the Study Area. This species is known to roost in Grey Mangroves, which are likely to be present in the vicinity of King Bay to the west of the Study Area. It is unlikely that the Project will impact this species.

During both the pre-wet season, and post-wet season surveys, camera traps were deployed in rocky outcrop areas, and nightly spotlight searches were conducted, in an effort to record the Northern Quoll (*D. hallucatus*) and Pilbara Olive Python (*L. o. barroni*). Cage and Elliot trapping conducted in rocky outcrop sites as part of the broader post-wet season survey is also suitable for the Northern Quoll. Despite this survey effort, neither species was recorded during the APM surveys. While the survey design was appropriate, both species are cryptic and often inhabit complex landscapes where detection is difficult. As a result, the lack of records should not be interpreted as an absence of either species. Given the close proximity of recent records of both species, it is possible that both may be present, albeit infrequently within the Study Area.

The development of the Study Area may present a risk to some species via habitat fragmentation, particularly the Northern Quoll. While 4,913 ha of appropriate habitat has been protected in Murujuga National Park, resulting in 44% of the Burrup Peninsula land mass available for this species being protected from further disturbance, development of the Study Area will effectively separate the northern regions of the peninsula from the southern areas and mainland. This may cause significant fragmentation of the Burrup Peninsula Northern Quoll population. Development of the Study Area may also locally exacerbate the factors that have contributed to the decline of this species. Specifically, the development will not impact denning habitat but will decrease foraging habitat by land clearing and may increase the frequency of fires and the presence of introduced predators such as feral cats (*F. catus*) and red foxes (*V. vulpes*), disease and habitat fragmentation (Hill & Ward, 2010).

REFERENCES

Abrahams, H., Mulvaney, M., Glasco, D., & Bugg, A. (1995) Areas of Conservation Significance on Cape York Peninsula. Available online: http://www.environment.gov.au/archive/erin/cyplus/lup/index.html [accessed December 2018].

Atlas of Living Australia (2018) Atlas of Living Australia. Available online: https://www.ala.org.au/ [accessed December 2018]

Astron Environmental (2001a) *Flora and Vegetation Survey of the Proposed Ammonia Plant*. Unpublished report for Sinclair Knight Merz Pty Ltd.

Astron Environmental (2001b) *Burrup Fertilisers Pty Ltd. Fauna of the Burrup Peninsula and the Proposed Ammonia Plant (Revised version)*. Unpublished report to Sinclair Knight Merz Pty Ltd

Astron Environmental (2005) *Pluto LNG Development Vegetation and Flora Survey Site A*. Unpublished report for Woodside Petroleum.

Beard, J. S. (1975). *Vegetation Survey of WA, 1:1,000,000 series, Pilbara Sheet and Explanatory Notes*. University of Western Australia Press.

BHP (2017) *Mining Area C Southern Flank – Ghost Bat Research Plan, Western Australian Iron Ore*. P. 6-9 http://www.epa.wa.gov.au/sites/default/files/Proponent_response_to_submissions/Attachment%2010%20-%20Ghost%20Bat%20Research%20Plan.pdf

Blackwell and Cala (1979) *Vegetation and floristics of the Burrup Peninsula*. Report prepared for Woodside Petroleum.

Braithwaite, R. W. and Griffiths, A. D. (1994) *Demographic variation and range contraction in the northern quoll, Dasyurus hallucatus (Marsupialia : Dasyuridae)*. CSIRO Publishing, https://doi.org/10.1071/WR9940203.

Bureau of Meteorology (2019) *Climate Data Online*. Available online: http://www.bom.gov.au/climate/data/ [accessed May 2019].

Carwardine, J., S. Nicol, S. Van Leeuwen, B. Walters, J. Firn, A. Reeson, T.G. Martin & I. Chades (2014). *Priority Threat Management of Pilbara Species of Conservation Significance*. CSIRO Ecosystems Sciences, Brisbane. https://publications.csiro.au/rpr/pub?list=SEA&pid=csiro:EP14416.

Churchill, S., (2008) *Australian Bats*, Allen and Unwin, Crows Nest, Australia

Clarke RK and Gorley RN (2015) *PRIMER v7: User Manual/Tutorial*. PRIMER-E.

Department of Conservation and Land Management (1999) *Environmental Weed Strategy for Western Australia*. Available online: https://www.dpaw.wa.gov.au/images/documents/plants-animals/plants/weeds/environmental_weed_strategy_wa.pdf [accessed December 2018].

Department of the Environment (2012) *Interim Biogeographic Regionalisation for Australia (Regions - States and Territories) v. 7*. ESRI shapefile available online: http://intspat01.ris.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7BFB89EEC9-5ABE-4CCD-B50E-7D485A3BAA4C%7D [accessed December 2018].

Department of Environment and Conservation (2013) *Murujuga National Park Management Plan 78*. Available online: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/murujuga-national-park-management-web-final.pdf [accessed December 2018].

Department of Mineral and Petroleum Resources (2002) *Vegetation Associations of the Burrup Peninsula, Western Australia. Coloured to show the frequency of occurrence in classes as a guide to the relative rarity within the Burrup Peninsula*. 1: 8,000; February 2002.

Department of Parks and Wildlife (2013). Recovery Plan for Five Species of Rock Wallabies. Available online: http://www.environment.gov.au/system/files/resources/a707e585-3f05-4540-bf3d-1b28ff57d455/files/rock-wallabies-recovery-plan.pdf [accessed December 2018]

Department of the Environment and Energy (2017). EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species, Commonwealth of Australia 2017

Department of the Environment and Energy (2018) *Species Profile and Threats Database*. Available online: http://www.environment.gov.au/sprat [accessed November 2018]

Department of Water and Environmental Regulation (2018) *MapViewer*. Available online: https://cps.dwer.wa.gov.au [accessed December 2018].

Doughty, P., Rolfe, J. K., Burbidge, A. H., Pearson, D. J. and Kendrick, P. G. (2011) *Herpetological Assemblages of the Pilbara Biogeographic Region, Western Australia: Ecological Associations, Biogeographic Patterns and Conservation*. Records of the Western Australian Museum, Supplement 78:315–341

English, V. and Blyth, J. (1997). Identifying and Conserving Threatened Ecological Communities (TECS) in the South West Botanical Province. Department of Conservation and Land Management.

ENV Australia (2006) *Site B North Flora and Vegetation Assessment Survey.* Available online: http://www.epa.wa.gov.au/sites/default/files/PER_documentation/1632-PER-Technical%20Report%20-%20combined.pdf [accessewd December 2018]

Environmental Protection Authority of Western Australia (2000) *Report and Recommendations of the Environmental Protection Authority: Proposewd Gas to Synthetic Hydrocarbons Plant, Burrup Peninsula, Western Australia*. http://www.epa.wa.gov.au/sites/default/files/EPA_Report/947_B985.pdf [accessed December 2018].

Environmental Protection Authority of Western Australia (2001) *Report and Recommendations of the Environmental Protection Authority: Ammonia Plant, Burrup Peninsula*. Available online: http://www.epa.wa.gov.au/sites/default/files/EPA_Report/998_B1036.pdf [accessed December 2018].

Environmental Protection Authority of Western Australia (2002) *Report and Recommendations of the Environmental Protection Authority: Ammonia-Urea Plant, Burrup Peninsula*. Available online: http://www.epa.wa.gov.au/sites/default/files/EPA_Report/Bull_1065.pdf [accessed December 2018].

Environmental Protection Authority of Western Australia (2016a) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment*. Available online: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf [accessed December 2018]

EPA (2016b) *Environmental Factor Guideline: Flora and Vegetation*. Available online: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Guideline-Flora-Vegetation-131216_4.pdf [accessed June 2019].

EPA (2016c) *Technical Guidance: Terrestrial Fauna Surveys*. Available online: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Tech%20guidance-%20Terrestrial%20Fauna%20Surveys-Dec-2016.pdf [accessed June 2019].

EPA (2016d) *Technical Guidance: Sampling methods for terrestrial vertebrate fauna*. Available online: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Tech%20guidance-%20Sampling-TV-fauna-Dec2016.pdf [accessed June 2019].

EPA (2016e) *Environmental Factor Guideline: Terrestrial Fauna*. Available online: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Guideline-Terrestrial-Fauna-131216_3.pdf [accessed June 2019].

Hickman, A.H. (1983) *Geology of the Pilbara Block and its Environs*. Geological Survey of Western Australia. Bulletin 127.

Hill B. M. and Ward S. J. (2010) *National Recovery Plan for the Northern Quoll Dasyurus hallucatus*. Department of Natural Resources, Environment, The Arts and Sport, Darwin.

Keighery (1994) *Vegetation Condition Scale adapted from Keighery 1994 and Trudgen 1988 as presented in the Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment*. Environmental Protection Authority. Government of Western Australia.

M.E. Trudgen & Associates (2002) *A flora, vegetation and floristic survey of the Burrup Peninsula, some adjoining areas and part of the Dampier Archipelago, with comparisons to the floristics of areas on the adjoining mainland Volume 1*. Vegetation survey prepared for Department of Mineral and Petroleum Resources.

McKenzie, N. L., May, J. E. and McKenna, S. (2003) *Bioregional Summary of the 2002 Biodiversity Audit for Western Australia*. Available online: https://www.dpaw.wa.gov.au/images/documents/about/science/projects/waaudit/2002_bio_summary.pdf [accessed December 2018].

Michael, D. and Lindenmayer, D. (2018) *Rocky Outcrops in Australia: Ecology, Conservation and Management*. CSIRO Publishing. https://books.google.com.au/books?hl=en&lr=&id=Y_9JDwAAQBAJ&oi=fnd&pg=PP1&dq=Conserving+Pilbara+olive+pythons+on+the+Burrup&ots=mwVc0P98N7&sig=c3Z1gmzIlGWsynQ960qJrOCwZGY#v=onepage&q&f=false

O'Brien Planning Consultants (1996) *Burrup Peninsula Land Use Plan and Management Strategy*. Available online: https://www.landcorp.com.au/Documents/Projects/Industrial/Burrup%20SIA/Burrup-Strategic-Industrial-Area-Land-Use-Plan-and-Management-Strategy-LandCorp.pdf [accessed December 2018].

Outback Ecology (2009) *Level 1 Flora Survey. Proposed Technical Ammonium Nitrate Production Facility site, Burrup Peninsula*. Unpublished report prepared for ERM on behalf of Burrup Fertilisers Pty Ltd.

Pearson, D. J. (2006) *Giant Pythons of the Pilbara*, Landscope, vol. 19, pp. 32-39.

Pearson, D. J. and Eldridge, M. D. B. (2008) Rothschild's Rock wallaby Petrogale rothschildi. Pp.389-390 In S. van Dyck and R. Strahan (eds.) *The Mammals of Australia 3rd Edition*. Reed New Holland, Sydney.

Richards, G. C., Hand, S., Armstrong, K. A., & Hall, L. S. (2008). Ghost Bat Macroderma gigas. In *The Mammals of Australia*. Third Edition. (Eds S. Van Dyck & R. Strahan), pp. 449-450. Reed New Holland, Chatswood.

Schmitt, L.H., Bradley, A.J., Kemper, C.M., Kitchener, D.J., Humphreys, W.F., How, R.A., (1989) *Ecology and physiology of the northern quoll, Dasyurus hallucatus (Marsupialia, Dasyuridae), at Mitchell Plateau, Kimberley, Western Australia*. Journal of Zoology 217, 539-558.

Thackway, R. and Cresswell, I. D. (1995) *An Interim Biogeographic Regionalisation for Australia*. Available online: https://www.environment.gov.au/system/files/resources/4263c26f-f2a7-4a07-9a29-b1a81ac85acc/files/ibra-framework-setting-priorities-nrs-cooperative-program.pdf [accessed September 2018].

Trudgen, M.E. (1988) *A Report on the Flora and Vegetation of the Port Kennedy Area*. Unpublished report prepared for Bowman Bishaw and Associates, West Perth.

Trudgen, M.E. and Griffin, E. A. (2001) *Floristic analysis of vegetation site data from the Burrup Peninsula, Dolphin, Angel and Gidley Islands with data from Cape Preston the Chichester Ranges and other locations. A flora, vegetation and floristic survey of the Burrup Peninsula, some adjoining areas and part of the Dampier Archipelago, with comparisons to the floristics of areas on the adjoining mainland Volume 2*. For the Department of Mineral and Petroleum Resources. Perth, WA.

Trudgen, M. E, Weston, A. and Long, V. (2001) *Burrup Vegetation Classification*. Unpublished Flora List of Burrup Peninsula.

Worley Astron (2006) *Pluto LNG Development Desktop Fauna Report*. Prepared for Sinclair Knight Merz.

van Dyck, S. and Strahan, R. (2008) *The Mammals of Australia* (3rd ed). New Holland Publishers, Sydney

van Vreeswyk, K. A., Payne, A. M. E., Leighton, A. L. and Hennig, P. (2004) *An inventory and condition survey of the Pilbara region, Western Australia*. Available online: https://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1006&context=tech_bull [accessed December 2018].

Western Australian Herbarium (1998–) *FloraBase—the Western Australian Flora*. Available online: https://florabase.dpaw.wa.gov.au/ [accessed December 2018]

Western Wildlife (2008). *Phil's Creek Project Area: Fauna Survey*. Available online: http://www.environment.gov.au/epbc/notices/assessments/2009/5107/reconsider-additional-doc2.pdf [accessed December 2018]

Woinarski, J. C. Z., Burbidge, A. A., & Harrison, P. L. (2014). *The Action Plan for Australian Mammals 2012*. CSIRO Publishing, Collingwood.

Worley Astron (2006) *Pluto LNG Development Desktop Fauna Report 2006*. Unpublished report for Sinclair Knight Merz.

APPENDICES

APPENDIX A: DEPARTMENT OF BIODIVERSITY CONSERVATION AND ATTRACTIONS PROTECTED BIOTA CATEGORIES

Department of Parks and Wildlife

CONSERVATION CODES

For Western Australian Flora and Fauna

Specially protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

T **Threatened species**

Published as Specially Protected under the *Wildlife Conservation Act 1950,* and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR **Critically endangered species**

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EN **Endangered species**

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

VU **Vulnerable species**

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EX **Presumed extinct species**

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

IA **Migratory birds protected under an international agreement**

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.

CD Conservation dependent fauna

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

OS Other specially protected fauna

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

[1] The definition of flora includes algae, fungi and lichens
[2]Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

APPENDIX B: DATABASE (2018) AND HISTORICAL SURVEY TERRESTRIAL FAUNA AND FLORA RECORDS

Taxon	Cons_Code	Latitude	Longitude	Date
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	1	-21.68333333	115.1333333	3/08/1963
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	1	-20.66666667	117.15	/08/1982
Atriplex lindleyi subsp. conduplicata	3	-20.85055556	116.5519444	7/11/1996
Carpobrotus sp. Thevenard Island (M. White 050)	3	-21.46319444	115.0196	24/08/1990
Carpobrotus sp. Thevenard Island (M. White 050)	3	-21.46666667	115.0166667	23/06/1988
Corchorus congener	3	-20.88305556	115.3266667	21/11/1965
Corchorus congener	3	-20.76666667	115.4	/10/1980
Corchorus congener	3	-20.76666667	115.4	/10/1980
Corchorus congener	3	-20.88305556	115.3266667	29/04/1964
Corchorus congener	3	-20.76666667	115.4	4/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.80199897	115.449625	1/10/2015
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.76666667	115.4	/10/1980
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.78333333	115.3333333	5/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.88305556	115.3266667	/06/1964
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.88305556	115.3266667	26/06/1964
Eleocharis papillosa	3	-21.738935	114.979944	14/03/2011
Eragrostis lanicaulis	3	-20.62972222	117.1897222	/03/1921
Eragrostis lanicaulis	3	-20.62972222	117.1897222	/03/1921
Eragrostis surreyana	3	-20.566933	116.823335	27/06/2000
Eragrostis surreyana	3	-20.56538889	116.8237778	27/05/2009
Eragrostis surreyana	3	-20.56552778	116.824	27/05/2009
Eremophila forrestii subsp. viridis	3	-21.77557918	115.0539952	19/08/2009
Eremophila forrestii subsp. viridis	3	-21.78277778	115.1116667	28/08/1960
Gomphrena cucullata	3	-20.8619	116.58295	11/07/2004
Gomphrena leptophylla	3	-20.8619	116.58295	11/07/2004
Goodenia nuda	4	-21.10981887	115.9935363	31/07/2002
Goodenia pallida	1	-20.83333333	116.5	11/08/1970
Gymnanthera cunninghamii	3	-20.59472222	116.6113889	13/06/1962
Gymnanthera cunninghamii	3	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3	-20.605	116.4833333	13/05/1982
Gymnanthera cunninghamii	3	-20.6	116.4833333	2/09/1987
Helichrysum oligochaetum	1	-20.66	117.18	//
Helichrysum oligochaetum	1	-20.65	117.1833333	//
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	-20.74444	116.74772	21/08/2005
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	-20.80192	116.58086	21/08/2005
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	-20.79114	116.79464	11/09/2004
Owenia acidula	3	-21.18333333	115.9833333	//
Owenia acidula	3	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	-21.18333333	115.9833333	19/08/1966
Owenia acidula	3	-21.18666667	115.9816667	5/03/1953
Pentalepis trichodesmoides subsp. hispida	2	-20.63333333	117.2	8/10/1992
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.69025	116.727778	30/11/2010
Rhynchosia bungarensis	4	-20.56552778	116.824	27/05/2009
Rhynchosia bungarensis	4	-20.63722222	116.788	26/05/2009
Rhynchosia bungarensis	4	-20.56552778	116.824	27/05/2009
Rhynchosia bungarensis	4	-20.57205556	116.8086111	27/05/2009
Rhynchosia bungarensis	4	-20.64794444	116.7592778	29/05/2009
Rhynchosia bungarensis	4	-20.59472222	116.6113889	14/06/1962
Rhynchosia bungarensis	4	-20.50805556	116.84	5/06/1962
Rhynchosia bungarensis	4	-20.63333333	116.6333333	9/11/1987
Rhynchosia bungarensis	4	-20.6	116.5166667	19/07/1980
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.487416	116.832863	29/05/2000
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4	-20.574043	116.805097	26/06/2000
Rhynchosia bungarensis	4	-20.61269	116.782273	22/05/2000
Rhynchosia bungarensis	4	-20.534969	116.819554	27/05/2000
Rhynchosia bungarensis	4	-20.606376	116.756965	26/05/2000
Rhynchosia bungarensis	4	-20.533712	116.819134	27/05/2000
Rhynchosia bungarensis	4	-20.615432	116.758045	26/05/2000
Rhynchosia bungarensis	4	-20.533695	116.838079	27/05/2000
Rhynchosia bungarensis	4	-20.533695	116.838079	27/05/2000
Rhynchosia bungarensis	4	-20.566045	116.82089	5/06/2000
Rhynchosia bungarensis	4	-20.549081	116.844855	25/05/2000
Rhynchosia bungarensis	4	-20.640271	116.777358	20/05/2000
Rhynchosia bungarensis	4	-20.546327	116.828242	25/05/2000
Rhynchosia bungarensis	4	-20.638945	116.786661	20/05/2000
Rhynchosia bungarensis	4	-20.665256	116.745265	3/06/2000
Rhynchosia bungarensis	4	-20.645762	116.761779	21/05/2000
Rhynchosia bungarensis	4	-20.69183	116.721464	28/05/2000
Rhynchosia bungarensis	4	-20.648958	116.759739	21/05/2000
Rhynchosia bungarensis	4	-20.566793	116.819181	5/06/2000
Rhynchosia bungarensis	4	-20.548369	116.837843	25/05/2000
Rhynchosia bungarensis	4	-20.78333333	116.7666667	21/09/1983
Rhynchosia bungarensis	4	-21.04651731	116.2398665	7/06/2017
Schoenus punctatus	3	-20.56589139	116.8235573	10/07/1999
Stackhousia clementii	3	-20.63026737	116.784159	30/04/2002
Stackhousia clementii	3	-20.72520548	116.7560462	24/02/2013
Stackhousia clementii	3	-21.68456	115.118028	30/08/2011
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.652806	117.133444	7/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.621222	117.150917	9/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.624361	117.143611	10/03/2008
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.616417	117.150972	5/10/2007

Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.62675509	117.1810431	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.64340538	117.0941985	3/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.62334288	117.1491159	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.6213672	117.1654401	3/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.62334288	117.1491159	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.62972222	117.1897222	/08/1984
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.63333333	117.2	8/10/1992
Terminalia supranitifolia	3	-20.66666667	116.7	/12/1986
Terminalia supranitifolia	3	-20.67040184	116.7569983	2/11/1998
Terminalia supranitifolia	3	-20.64153748	116.796257	12/11/1998
Terminalia supranitifolia	3	-20.6359749	116.7917049	15/11/1998
Terminalia supranitifolia	3	-20.63333333	116.75	6/12/1978
Terminalia supranitifolia	3	-20.63597546	116.7916969	15/11/1998
Terminalia supranitifolia	3	-20.64153102	116.7962525	12/11/1998
Terminalia supranitifolia	3	-20.67039265	116.7570029	2/11/1998
Terminalia supranitifolia	3	-20.63861588	116.7937555	10/11/1998
Terminalia supranitifolia	3	-20.64257507	116.7732557	26/11/1998
Terminalia supranitifolia	3	-20.65113121	116.7725423	26/11/1998
Terminalia supranitifolia	3	-20.63333333	116.8	11/03/1983
Terminalia supranitifolia	3	-20.63333333	116.8	11/03/1983
Terminalia supranitifolia	3	-20.63333333	116.8	11/03/1983
Terminalia supranitifolia	3	-20.78333333	116.7666667	10/02/1982
Terminalia supranitifolia	3	-20.66666667	116.75	21/07/2004
Terminalia supranitifolia	3	-20.66666667	116.7	/12/1971
Terminalia supranitifolia	3	-20.65430143	116.7784031	24/11/1998
Terminalia supranitifolia	3	-20.65839632	116.7796453	5/11/1998
Terminalia supranitifolia	3	-20.65611998	116.773226	24/11/1998
Terminalia supranitifolia	3	-20.64520398	116.7798082	22/11/1998
Terminalia supranitifolia	3	-20.64068437	116.7785477	22/11/1998
Terminalia supranitifolia	3	-20.66687903	116.764387	28/11/1998
Terminalia supranitifolia	3	-20.66859454	116.7634242	2/11/1998
Terminalia supranitifolia	3	-20.66073537	116.7717119	3/11/1998
Terminalia supranitifolia	3	-20.64303766	116.7677738	28/11/1998
Terminalia supranitifolia	3	-20.65870665	116.7750463	3/11/1998
Terminalia supranitifolia	3	-20.63536052	116.7993944	10/11/1998
Terminalia supranitifolia	3	-20.63333333	116.8	/05/1983
Terminalia supranitifolia	3	-20.65249621	116.7871513	8/11/1998
Terminalia supranitifolia	3	-20.65143609	116.7921831	8/11/1998
Terminalia supranitifolia	3	-20.63373596	116.7859391	20/11/1998
Terminalia supranitifolia	3	-20.64244207	116.78226	20/11/1998
Terminalia supranitifolia	3	-20.64676249	116.7832234	18/11/1998
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	3	-20.72916667	116.7622222	20/08/1992
Triumfetta echinata	3	-21.77707459	115.0853797	1/11/2009
Triumfetta echinata	3	-21.63805556	115.3438889	25/10/1980
Triumfetta echinata	3	-21.59972222	115.2938889	5/11/1996
Vigna triodiophila	3	-20.61416667	116.7752778	9/06/2011
Vigna triodiophila	3	-20.609139	116.782	21/05/2000
Vigna triodiophila	3	-20.648704	116.759173	21/05/2000
Vigna triodiophila	3	-20.58063	116.79481	22/05/2000
Vigna triodiophila	3	-20.64661469	116.7606137	29/05/2009
Vigna triodiophila	3	-20.68711287	117.0081136	26/05/2009
Vigna triodiophila	3	-20.649002	116.75947	21/05/2000
Vigna triodiophila	3	-20.61074796	116.7630429	31/03/2011

COM_NAME	STATE_CATG
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1

Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pool communities	Priority 1
Burrup Peninsula rock pool communities	Priority 1
Burrup Peninsula rock pool communities	Priority 1

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1980
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1983
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1977
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1981
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5872	-20.4689	1998
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.85	-20.45	2005
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.91	-20.41	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.8494	-20.4843	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6283	-20.4564	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6343	-20.5843	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1983
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1983
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1984
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6343	-20.5843	1984
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.8494	-20.4843	1990
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1990
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6343	-20.5843	1990
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5872	-20.4689	1998
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.85	-20.45	2005
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6283	-20.4564	0
Anous stolidus	Anous	stolidus	common noddy	116.7833	-20.5833	1988
Anous stolidus	Anous	stolidus	common noddy	116.6283	-20.4564	0
Anous stolidus	Anous	stolidus	common noddy	116.5381	-20.4778	1983
Anous stolidus	Anous	stolidus	common noddy	116.6254	-20.4528	1983
Anous stolidus	Anous	stolidus	common noddy	116.6283	-20.4564	0
Apus pacificus	Apus	pacificus	fork-tailed swift	116.5194	-20.6069	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1977
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1974
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1966
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.58	-20.58	1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.58	-20.58	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5808	-20.4758	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5872	-20.4689	1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6583	-20.525	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.91	-20.41	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7768	-20.5405	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6592	-20.6094	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6225	-20.4697	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5381	-20.4778	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6396	-20.4392	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5936	-20.4817	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6343	-20.5843	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8064	-20.4931	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8056	-20.3858	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7768	-20.5405	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.4444	-20.6572	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6831	-20.6547	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6225	-20.4697	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5194	-20.6069	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8317	-20.3889	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5381	-20.4778	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	1982
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	1990

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7768	-20.5405	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5194	-20.6069	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7768	-20.5405	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8317	-20.3889	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.4444	-20.6572	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6393	-20.4388	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5381	-20.4778	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5194	-20.6069	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8056	-20.3858	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8064	-20.4931	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5936	-20.4817	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8317	-20.3889	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6393	-20.4388	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5936	-20.4817	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5381	-20.4778	1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5936	-20.4817	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6343	-20.5843	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6583	-20.525	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5808	-20.4758	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5872	-20.4689	1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	1978
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6225	-20.4697	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8064	-20.4931	2014
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7768	-20.5405	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8317	-20.3889	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8806	-20.3881	1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8202	-20.5862	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6583	-20.525	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5822	-20.4745	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5885	-20.4676	1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7597	-20.6403	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7047	-20.6662	2010
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7972	-20.6331	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5013	-20.4987	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.918	-20.4153	1980
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5847	-20.582	1980
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5847	-20.4153	1980
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5847	-20.4153	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7513	-20.582	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7513	-20.582	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5847	-20.582	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5847	-20.4153	1978
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5013	-20.4987	1977
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5847	-20.582	1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5847	-20.4153	1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7513	-20.582	1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5013	-20.4987	1980
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe	116.5194	-20.6069	1984
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe	116.4444	-20.6572	1990
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe	116.5194	-20.6069	1990
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe	116.7513	-20.582	1981
Calidris alba	Calidris	alba	sanderling	116.5	-20.5	1983
Calidris alba	Calidris	alba	sanderling	116.85	-20.45	2005
Calidris alba	Calidris	alba	sanderling	116.8513	-20.4487	2005
Calidris alba	Calidris	alba	sanderling	116.8806	-20.3881	1998
Calidris alba	Calidris	alba	sanderling	116.8513	-20.4487	2005
Calidris alba	Calidris	alba	sanderling	116.5013	-20.4987	1981
Calidris canutus	Calidris	canutus	red knot, knot	116.4444	-20.6572	1990
Calidris canutus	Calidris	canutus	red knot, knot	116.5	-20.5	1980
Calidris canutus	Calidris	canutus	red knot, knot	116.8494	-20.4843	1978
Calidris canutus	Calidris	canutus	red knot, knot	116.5013	-20.4987	1980
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper	116.8494	-20.4843	1990
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper	116.5194	-20.6069	1990
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper	116.5	-20.5	1977
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper	116.5	-20.5	1966
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper	116.5013	-20.4987	1977
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5936	-20.4817	1984
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.8494	-20.4843	1990
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5936	-20.4817	1990
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5	-20.5	1977
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5	-20.5	1983
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5	-20.5	1980
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5	-20.5	1981
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.85	-20.45	2005
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.8513	-20.4487	2005
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.8513	-20.4487	2005
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.7988	-20.6323	2010
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.7972	-20.6331	1999
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5013	-20.4987	1981
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5847	-20.4153	1978
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5013	-20.4987	1978
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5013	-20.4987	1977
Calidris ruficollis	Calidris	ruficollis	red-necked stint	116.5013	-20.4987	1980
Caretta caretta	Caretta	caretta	loggerhead turtle	116.917	-20.3999	2008
Caretta caretta	Caretta	caretta	loggerhead turtle	116.8317	-20.3889	1984
Caretta caretta	Caretta	caretta	loggerhead turtle	116.917	-20.3999	2008
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.6283	-20.4564	0

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.8494	-20.4843	1990
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.5381	-20.4778	1990
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.675	-20.5178	1990
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.6283	-20.4564	1983
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.675	-20.5178	1983
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.5	-20.5	1983
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.5	-20.5	1966
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.8064	-20.4931	2014
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.6283	-20.4564	0
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.8202	-20.5862	1999
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.8183	-20.5817	1999
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.7597	-20.6403	1999
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.7819	-20.5903	1999
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.7988	-20.6323	2010
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.7047	-20.6662	2010
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.7972	-20.6331	1999
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.5013	-20.4987	1981
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l	116.5847	-20.4153	1981
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.8494	-20.4843	1990
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.5194	-20.6069	1990
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.6283	-20.4564	1990
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.5936	-20.4817	1990
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.5936	-20.4817	1982
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.6283	-20.4564	1983
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.5194	-20.6069	1984
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.85	-20.45	2005
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.85	-20.45	2005
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.8494	-20.4843	1978
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.8806	-20.3881	1998
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.8513	-20.4487	2005
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.7988	-20.6323	2010
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.7513	-20.582	1977
Charadrius mongolus	Charadrius	mongolus	lesser sand plover	116.5847	-20.4153	1977
Charadrius veredus	Charadrius	veredus	oriental plover	116.5194	-20.6069	1990
Charadrius veredus	Charadrius	veredus	oriental plover	116.6283	-20.4564	1990
Charadrius veredus	Charadrius	veredus	oriental plover	116.5194	-20.6069	1984
Chelonia mydas	Chelonia	mydas	green turtle	116.6623	-20.5327	2015
Chelonia mydas	Chelonia	mydas	green turtle	116.5194	-20.6069	0
Chelonia mydas	Chelonia	mydas	green turtle	116.5389	-20.5356	0
Chelonia mydas	Chelonia	mydas	green turtle	116.675	-20.5178	0
Chelonia mydas	Chelonia	mydas	green turtle	116.5936	-20.4817	0
Chelonia mydas	Chelonia	mydas	green turtle	116.5194	-20.6069	0
Chelonia mydas	Chelonia	mydas	green turtle	116.5936	-20.4817	2012
Chelonia mydas	Chelonia	mydas	green turtle	116.5389	-20.5356	1992
Chelonia mydas	Chelonia	mydas	green turtle	116.8064	-20.4931	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.8056	-20.3858	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.8494	-20.4843	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.4444	-20.6572	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.5194	-20.6069	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.5389	-20.5356	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.8317	-20.3889	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.6283	-20.4564	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.8806	-20.3881	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.675	-20.5178	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.5936	-20.4817	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.6343	-20.5843	1990
Chelonia mydas	Chelonia	mydas	green turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Chelonia mydas	Chelonia	mydas	green turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Chelonia mydas	Chelonia	mydas	green turtle	116.917	-20.3999	2009

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Chelonia mydas	Chelonia	mydas	green turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Chelonia mydas	Chelonia	mydas	green turtle	116.5745	-20.4629	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1899
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1900
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.748	-20.6227	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4854	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8332	-20.4876	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8344	-20.4842	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8345	-20.4839	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8347	-20.4837	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8332	-20.4876	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8345	-20.4839	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8332	-20.4876	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4833	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8351	-20.4831	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8346	-20.4861	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8337	-20.4833	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4843	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8296	-20.4902	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.834	-20.4865	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8343	-20.4864	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8357	-20.4846	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8358	-20.4844	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8359	-20.4842	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8364	-20.4838	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8365	-20.4836	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8361	-20.484	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8357	-20.4846	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8334	-20.4839	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8361	-20.484	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8329	-20.4867	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8308	-20.4889	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8335	-20.4836	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8807	-20.4282	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8803	-20.4284	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8803	-20.4284	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8812	-20.4275	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8824	-20.4267	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8828	-20.4256	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8763	-20.4345	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8798	-20.4334	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8827	-20.4264	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8791	-20.4337	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.882	-20.427	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4816	2014

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8337	-20.4833	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4843	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8329	-20.4867	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8365	-20.4836	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8331	-20.4849	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8824	-20.4267	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8798	-20.4334	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8828	-20.4256	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8763	-20.4345	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8827	-20.4264	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.881	-20.4279	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8332	-20.4821	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8296	-20.4902	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8346	-20.4861	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8359	-20.4842	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.881	-20.4279	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8812	-20.4275	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.882	-20.427	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8786	-20.4337	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8828	-20.426	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4843	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8302	-20.4896	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8332	-20.4879	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8332	-20.4876	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4874	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8315	-20.4882	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8763	-20.4345	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8844	-20.4825	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8825	-20.4825	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8812	-20.4275	2014
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8004	-20.5705	1990
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.7723	-20.6376	1990
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.809	-20.5724	1990
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.7884	-20.638	1990
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8324	-20.4874	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8235	-20.5176	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8235	-20.5176	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8247	-20.5164	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8314	-20.4885	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8328	-20.4852	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.833	-20.4822	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8331	-20.4822	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8335	-20.4825	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8335	-20.4844	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8344	-20.4865	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4837	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4852	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8353	-20.4833	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8247	-20.5164	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4855	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8295	-20.4903	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8299	-20.49	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8307	-20.4891	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8329	-20.4883	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8351	-20.4848	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8702	-20.4373	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8726	-20.4366	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8697	-20.4392	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8727	-20.4374	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8702	-20.4373	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8699	-20.4383	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8726	-20.4366	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8734	-20.4351	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8295	-20.4903	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4818	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4843	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4837	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8351	-20.4848	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8242	-20.5171	2015

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8699	-20.4383	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.872	-20.4372	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8734	-20.4351	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8317	-20.4881	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4818	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8339	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.834	-20.4869	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8712	-20.4375	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8702	-20.4373	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8699	-20.4383	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8727	-20.4365	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4816	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8306	-20.4894	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8337	-20.4872	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4856	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4847	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4837	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8359	-20.4822	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8335	-20.484	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.486	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8337	-20.4872	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8348	-20.484	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8351	-20.4832	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8357	-20.4825	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8329	-20.4884	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8359	-20.4822	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8346	-20.486	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4875	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8302	-20.4896	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8326	-20.487	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8328	-20.4852	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8316	-20.4883	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8329	-20.4884	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8348	-20.484	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8362	-20.4819	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8361	-20.482	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4816	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8354	-20.483	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4816	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.486	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8297	-20.4902	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8328	-20.4886	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8301	-20.4897	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8376	-20.4801	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8304	-20.4895	2016
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8	-20.5	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.9	-20.5	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1900
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.5	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.85	-20.4833	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	1978
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	1970
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	2012

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5119	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8217	-20.5118	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8522	-20.4495	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8525	-20.4493	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8522	-20.4495	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8525	-20.4493	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8217	-20.5118	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8212	-20.5119	2012
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.835	-20.4855	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8307	-20.4891	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8339	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8333	-20.4818	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8727	-20.4365	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8295	-20.4903	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8351	-20.4848	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8329	-20.4883	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.833	-20.4822	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8324	-20.4874	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8335	-20.4844	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8328	-20.4852	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8326	-20.487	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8328	-20.4852	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8316	-20.4883	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8329	-20.4884	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8316	-20.4883	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8348	-20.484	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8362	-20.4819	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8361	-20.482	2015
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Dasyurus hallucatus	Dasyurus	hallucatus	northern quoll	116.845	-20.5151	2013

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.917	-20.3999	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.9336	-20.4109	2009
Eretmochelys imbricata	Eretmochelys	imbricata	hawksbill turtle	116.5905	-20.4846	2017
Falco peregrinus	Falco	peregrinus	peregrine falcon	116.8022	-20.5909	2006
Falco peregrinus	Falco	peregrinus	peregrine falcon	116.8013	-20.6153	2000
Falco peregrinus	Falco	peregrinus	peregrine falcon	116.7513	-20.582	1980
Falco peregrinus	Falco	peregrinus	peregrine falcon	116.5013	-20.4987	1977
Falco peregrinus	Falco	peregrinus	peregrine falcon	116.7513	-20.582	1979
Fregata ariel	Fregata	ariel	lesser frigatebird	116.8056	-20.3858	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.7768	-20.5405	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.8494	-20.4843	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6225	-20.4697	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5194	-20.6069	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6283	-20.4564	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6943	-20.5202	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5936	-20.4817	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5936	-20.4817	1982
Fregata ariel	Fregata	ariel	lesser frigatebird	116.8064	-20.4931	1982
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6225	-20.4697	1983
Fregata ariel	Fregata	ariel	lesser frigatebird	116.8056	-20.3858	1983
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6283	-20.4564	1983
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5936	-20.4817	1984
Fregata ariel	Fregata	ariel	lesser frigatebird	116.8806	-20.3881	1984
Fregata ariel	Fregata	ariel	lesser frigatebird	116.4444	-20.6572	1984
Fregata ariel	Fregata	ariel	lesser frigatebird	116.8075	-20.3877	1984
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6943	-20.5202	1983
Fregata ariel	Fregata	ariel	lesser frigatebird	116.7768	-20.5405	1983
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5194	-20.6069	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5808	-20.4758	1999
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6675	-20.5203	2002
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6675	-20.5203	2002
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6667	-20.5194	2000
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6943	-20.5202	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.7768	-20.5405	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6225	-20.4697	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6283	-20.4564	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.8806	-20.3881	1998
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5	-20.5	1974
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5	-20.5	1981
Fregata ariel	Fregata	ariel	lesser frigatebird	116.53	-20.55	1962
Fregata ariel	Fregata	ariel	lesser frigatebird	116.58	-20.58	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.58	-20.58	1977
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5808	-20.4758	1999
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6667	-20.5194	2000
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6675	-20.5203	2002
Fregata ariel	Fregata	ariel	lesser frigatebird	116.91	-20.41	0
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5822	-20.4745	1999
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6675	-20.5203	2002
Fregata ariel	Fregata	ariel	lesser frigatebird	116.6675	-20.5203	2002
Fregata ariel	Fregata	ariel	lesser frigatebird	116.668	-20.5181	2000
Fregata ariel	Fregata	ariel	lesser frigatebird	116.918	-20.4153	1980
Fregata ariel	Fregata	ariel	lesser frigatebird	116.7513	-20.582	1980
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5847	-20.4153	1980
Fregata ariel	Fregata	ariel	lesser frigatebird	116.7513	-20.582	1980
Fregata ariel	Fregata	ariel	lesser frigatebird	116.7513	-20.582	1981
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5847	-20.4153	1981
Fregata ariel	Fregata	ariel	lesser frigatebird	116.7513	-20.582	1981
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5847	-20.4153	1978
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5847	-20.4153	1977
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5847	-20.582	1977
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5847	-20.582	1979
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5847	-20.582	1979

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Fregata ariel	Fregata	ariel	lesser frigatebird	116.5013	-20.4987	1980
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.8056	-20.3858	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.5936	-20.4817	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.8069	-20.3845	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.5949	-20.4803	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.8597	-20.4044	1984
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.8597	-20.4044	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.5936	-20.4817	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.8597	-20.4044	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.8073	-20.3847	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.7713	-20.6087	1997
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.5953	-20.4807	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.8069	-20.3845	0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali	116.5949	-20.4803	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8314	-20.3889	1987
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8314	-20.3889	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8314	-20.3889	1991
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6292	-20.4571	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6939	-20.5202	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5946	-20.4797	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5204	-20.6007	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4449	-20.6588	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5204	-20.6007	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5204	-20.6007	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4449	-20.6588	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8044	-20.3856	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.777	-20.5399	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.777	-20.5399	1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5	-20.5	1974
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5	-20.5	1978
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5	-20.5	1981
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5747	-20.5931	2008
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.58	-20.58	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5872	-20.4689	1998
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.63	-20.58	1901
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6583	-20.525	1999
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6667	-20.5194	2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6675	-20.5203	2002
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.85	-20.45	2005
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8519	-20.4492	2002
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8875	-20.3917	2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.91	-20.41	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8056	-20.3858	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6943	-20.5202	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5936	-20.4817	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1987
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8064	-20.4931	2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1991
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6169	-20.4441	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8056	-20.3858	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8494	-20.4843	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5381	-20.4778	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.675	-20.5178	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6943	-20.5202	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6737	-20.4485	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6732	-20.4512	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5079	-20.4995	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5936	-20.4817	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6149	-20.5694	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6343	-20.5843	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6169	-20.4441	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8494	-20.4843	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5389	-20.5356	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5381	-20.4778	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.675	-20.5178	1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7754	-20.5404	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.584	-20.5753	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.654	-20.5059	1983

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.675	-20.5178	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8332	-20.3806	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4513	-20.6649	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5079	-20.4995	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4487	-20.6526	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5936	-20.4817	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8336	-20.3834	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6737	-20.4485	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6343	-20.5843	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6149	-20.5694	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8336	-20.3834	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8056	-20.3858	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6737	-20.4485	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6169	-20.4441	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5381	-20.4778	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5079	-20.4995	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6343	-20.5843	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4449	-20.6588	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5204	-20.6007	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6939	-20.5202	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6292	-20.4571	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.654	-20.5059	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8056	-20.3858	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8494	-20.4843	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5389	-20.5356	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6737	-20.4485	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5946	-20.4797	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8494	-20.4843	1978
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8064	-20.4931	2014
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8064	-20.4931	2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8056	-20.3858	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1971
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1991
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1987
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6943	-20.5202	1971
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5936	-20.4817	1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8597	-20.4044	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4313	-20.6537	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5936	-20.4817	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6149	-20.5694	1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6943	-20.5202	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.654	-20.5059	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8806	-20.3881	2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8168	-20.5091	2015
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	1918
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	1918
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8056	-20.3858	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.7768	-20.5405	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.4444	-20.6572	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5194	-20.6069	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.8317	-20.3889	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6283	-20.4564	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.6943	-20.5202	0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern	116.5936	-20.4817	0
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.8486	-20.4884	1993
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.752	-20.633	2004
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7073	-20.6668	2005
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.767	-20.6571	2001
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.782	-20.593	2014
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.777	-20.599	2015
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.777	-20.598	2015
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.782	-20.592	2015
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7685	-20.624	2015
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7712	-20.6065	2016
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7785	-20.5949	2015

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7785	-20.5949	2015
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.777	-20.599	2016
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.771	-20.589	2016
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7675	-20.6131	2016
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.779	-20.595	2017
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.768	-20.613	2017
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7619	-20.6086	2018
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.7727	-20.6113	2018
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.8494	-20.4843	1990
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.6343	-20.5843	1990
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.8486	-20.4884	1993
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.8494	-20.4843	0
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.8119	-20.5735	0
Liasis olivaceus barroni	Liasis	olivaceus	Pilbara olive python	116.8494	-20.4843	0
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.85	-20.45	2005
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8494	-20.4843	0
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.4444	-20.6572	1983
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8494	-20.4843	1984
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8064	-20.4931	1990
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8494	-20.4843	1990
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.4444	-20.6572	1990
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.85	-20.45	2005
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8494	-20.4843	1978
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.7588	-20.6062	1998
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8105	-20.6059	1999
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8105	-20.6059	1999
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.7597	-20.6403	1999
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.8513	-20.4487	2005
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.7988	-20.6323	2010
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.7047	-20.6662	2010
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.7972	-20.6331	1999
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.5013	-20.4987	1981
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.918	-20.4153	1980
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.7513	-20.582	1977
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.5013	-20.4987	1978
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.5013	-20.4987	1978
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.5013	-20.4987	1977
Limosa lapponica	Limosa	lapponica	bar-tailed godwit	116.5013	-20.4987	1980
Limosa limosa	Limosa	limosa	black-tailed godwit	116.5013	-20.4987	1981
Macroderma gigas	Macroderma	gigas	ghost bat	116.8022	-20.5909	2006
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.8013	-20.5653	1999
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.9267	-20.3733	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.9267	-20.3733	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.9267	-20.3733	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.9267	-20.3733	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.9133	-20.3725	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.865	-20.3433	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.865	-20.3433	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.865	-20.3433	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.75	-20.35	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.75	-20.35	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.7367	-20.4533	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.7333	-20.3667	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.6467	-20.3967	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.69	-20.37	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.69	-20.37	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.69	-20.37	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.69	-20.37	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.61	-20.41	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.61	-20.41	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.61	-20.41	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.61	-20.41	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.52	-20.47	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.52	-20.47	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.52	-20.47	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.5	-20.48	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.46	-20.52	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.46	-20.52	2014
Megaptera novaeangliae	Megaptera	novaeangliae	humpback whale	116.46	-20.52	2014
Mormopterus (Ozimops) cobourgianus	Mormopterus	(Ozimops) cobourgian	north-western free-ta	116.8022	-20.5909	2006
Mormopterus (Ozimops) cobourgianus	Mormopterus	(Ozimops) cobourgian	north-western free-ta	116.8057	-20.6068	2001
Natator depressus	Natator	depressus	flatback turtle	116.8333	-20.6167	0
Natator depressus	Natator	depressus	flatback turtle	116.5194	-20.6069	1978
Natator depressus	Natator	depressus	flatback turtle	116.5936	-20.4817	2012
Natator depressus	Natator	depressus	flatback turtle	116.5194	-20.6069	1990
Natator depressus	Natator	depressus	flatback turtle	116.8317	-20.3889	1990
Natator depressus	Natator	depressus	flatback turtle	116.8806	-20.3881	1990
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2009

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2009

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2009

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2008

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2009

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2009

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2009
Natator depressus	Natator	depressus	flatback turtle	116.917	-20.3999	2009
Natator depressus	Natator	depressus	flatback turtle	116.9336	-20.4109	2009
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.868	-20.6487	1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.868	-20.6487	1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.868	-20.6487	1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.868	-20.6487	1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.6283	-20.4564	1983
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.8494	-20.4843	1984
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.8494	-20.4843	1990
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.85	-20.45	2005
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.8494	-20.4843	1978
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.8513	-20.4487	2005
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.7513	-20.582	1981
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.5013	-20.4987	1978
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.5013	-20.4987	1977
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.5013	-20.4987	1978
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew	116.5013	-20.4987	1977
Numenius minutus	Numenius	minutus	little curlew, little whi	116.7105	-20.6551	2010
Numenius minutus	Numenius	minutus	little curlew, little whi	116.7513	-20.582	1981
Numenius minutus	Numenius	minutus	little curlew, little whi	116.7513	-20.582	1981
Numenius minutus	Numenius	minutus	little curlew, little whi	116.7513	-20.582	1977
Numenius minutus	Numenius	minutus	little curlew, little whi	116.5013	-20.4987	1977
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.85	-20.45	2005
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6169	-20.4441	0
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5194	-20.6069	0
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6737	-20.4485	0
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6732	-20.4512	0
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8211	-20.4486	1982
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6283	-20.4564	1983
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5194	-20.6069	1983
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5194	-20.6069	1984
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5194	-20.6069	1984
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6737	-20.4485	1984
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6169	-20.4441	1984
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8064	-20.4931	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6169	-20.4441	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5194	-20.6069	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8211	-20.4486	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6283	-20.4564	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8806	-20.3881	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6737	-20.4485	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.6343	-20.5843	1990
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8513	-20.4487	2005
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8494	-20.4843	1978
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8806	-20.3881	1998
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8265	-20.4836	2015
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8215	-20.5195	2015
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8014	-20.5711	2001
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8105	-20.6059	1999
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7822	-20.6595	2004
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7597	-20.6403	1999
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7819	-20.5903	1999
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.8513	-20.4487	2005
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7988	-20.6323	2010
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7972	-20.6331	1999
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5013	-20.4987	1981
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7513	-20.582	1980
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7513	-20.582	1981
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7513	-20.582	1981
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5013	-20.4987	1978
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5013	-20.4987	1977
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.7513	-20.582	1978
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5013	-20.4987	1977
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5013	-20.4987	1979
Numenius phaeopus	Numenius	phaeopus	whimbrel	116.5013	-20.4987	1980
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.5	-20.5	1974
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.91	-20.41	0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.8494	-20.4843	0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.4444	-20.6572	0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.6343	-20.5843	1983
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.6404	-20.4913	1983
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.4444	-20.6572	1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.8064	-20.4931	1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.7408	-20.4168	1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.5528	-20.4818	1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.8494	-20.4843	0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.7322	-20.5958	2008
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel	116.918	-20.4153	1979
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.5	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.5	1981
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.5	1974
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.5	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.5	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.5	1981
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.5	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5747	-20.5931	2008
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.58	-20.58	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.58	-20.58	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.58	-20.58	1977

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5808	-20.4758	1999
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5825	-20.585	2008
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5872	-20.4689	1998
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.61	-20.58	1901
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.63	-20.58	1901
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.63	-20.58	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6583	-20.525	1999
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6667	-20.5194	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6675	-20.5203	2002
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.85	-20.45	2005
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8519	-20.4492	2002
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8875	-20.3917	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.91	-20.41	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.45	-20.666	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5	-20.6	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.616	-20.583	1901
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.866	-20.383	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.866	-20.383	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1987
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5479	-20.5379	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1987
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6254	-20.4528	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5946	-20.4797	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1976
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6169	-20.4441	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6592	-20.6094	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4313	-20.6537	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6225	-20.4697	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8211	-20.4486	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5389	-20.5356	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6796	-20.5419	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5381	-20.4778	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6396	-20.4392	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6737	-20.4485	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6732	-20.4512	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5079	-20.4995	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6149	-20.5694	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8211	-20.4486	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5389	-20.5356	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6787	-20.5216	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5327	-20.5428	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5389	-20.5356	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6254	-20.4528	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6225	-20.4697	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.653	-20.5039	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6796	-20.5419	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8321	-20.3883	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8024	-20.385	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1983

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6269	-20.4543	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6254	-20.4528	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5793	-20.5805	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6538	-20.5043	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8321	-20.3883	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4498	-20.6647	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5816	-20.579	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8024	-20.385	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4313	-20.6537	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5079	-20.4995	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5816	-20.579	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6786	-20.5218	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6149	-20.5694	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8056	-20.3858	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6737	-20.4485	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6254	-20.4528	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6169	-20.4441	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5381	-20.4778	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5389	-20.5356	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6149	-20.5694	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8505	-20.4796	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5204	-20.6007	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6742	-20.5151	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8049	-20.4927	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6342	-20.5841	1976
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4449	-20.6588	1987
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.777	-20.5399	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6253	-20.4526	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6292	-20.4571	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8314	-20.3889	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.654	-20.5059	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8056	-20.3858	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6796	-20.5419	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.88	-20.3861	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6943	-20.5202	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5473	-20.5379	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6737	-20.4485	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6225	-20.4697	1981
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	1970
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	1970
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1970
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1970
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1970
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1970
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1987
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5479	-20.5379	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6254	-20.4528	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1982
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1984

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1976
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1976
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6169	-20.4441	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8597	-20.4044	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6831	-20.6547	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6225	-20.4697	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4313	-20.6537	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8211	-20.4486	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5389	-20.5356	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6796	-20.5419	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5381	-20.4778	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6943	-20.5202	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6393	-20.4388	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6393	-20.4388	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6149	-20.5694	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6254	-20.4528	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.654	-20.5059	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6796	-20.5419	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5389	-20.5356	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	2004
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8169	-20.5092	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8273	-20.5152	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8347	-20.4846	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8222	-20.4231	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8181	-20.4136	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8064	-20.4931	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.7768	-20.5405	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8494	-20.4843	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.4444	-20.6572	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5479	-20.5379	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5194	-20.6069	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8317	-20.3889	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6254	-20.4528	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6283	-20.4564	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.8806	-20.3881	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.675	-20.5178	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.5936	-20.4817	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre	116.6343	-20.5843	0
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover	116.5	-20.5	1980
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover	116.6283	-20.4564	1983
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover	116.7047	-20.6662	2010
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover	116.5013	-20.4987	1980
Pluvialis squatarola	Pluvialis	squatarola	grey plover	116.5	-20.5	1983
Pluvialis squatarola	Pluvialis	squatarola	grey plover	116.8494	-20.4843	1990
Pluvialis squatarola	Pluvialis	squatarola	grey plover	116.4444	-20.6572	1990
Pluvialis squatarola	Pluvialis	squatarola	grey plover	116.4485	-20.6657	1983
Pluvialis squatarola	Pluvialis	squatarola	grey plover	116.7988	-20.6323	2010
Pluvialis squatarola	Pluvialis	squatarola	grey plover	116.5013	-20.4987	1981
Pseudomys chapmani	Pseudomys	chapmani	western pebble-mour	116.8313	-20.5787	1983
Pseudomys chapmani	Pseudomys	chapmani	western pebble-mour	116.7713	-20.6087	1994
Stenella longirostris	Stenella	longirostris	spinner dolphin	116.6633	-20.5342	2014
Sterna dougallii	Sterna	dougallii	roseate tern	116.538	-20.5352	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6737	-20.4482	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.5	-20.5	1974
Sterna dougallii	Sterna	dougallii	roseate tern	116.5	-20.5	1983
Sterna dougallii	Sterna	dougallii	roseate tern	116.58	-20.58	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.91	-20.41	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6732	-20.4512	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.5389	-20.5356	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.8597	-20.4044	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.8494	-20.4843	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6943	-20.5202	0

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Sterna dougallii	Sterna	dougallii	roseate tern	116.6396	-20.4392	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6737	-20.4485	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6732	-20.4512	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.5079	-20.4995	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.5936	-20.4817	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6343	-20.5843	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.8056	-20.3858	1990
Sterna dougallii	Sterna	dougallii	roseate tern	116.5381	-20.4778	1983
Sterna dougallii	Sterna	dougallii	roseate tern	116.5079	-20.4995	1984
Sterna dougallii	Sterna	dougallii	roseate tern	116.5079	-20.4995	1984
Sterna dougallii	Sterna	dougallii	roseate tern	116.8056	-20.3858	1984
Sterna dougallii	Sterna	dougallii	roseate tern	116.6737	-20.4485	1984
Sterna dougallii	Sterna	dougallii	roseate tern	116.6393	-20.4388	1984
Sterna dougallii	Sterna	dougallii	roseate tern	116.5936	-20.4817	1984
Sterna dougallii	Sterna	dougallii	roseate tern	116.8317	-20.3889	1990
Sterna dougallii	Sterna	dougallii	roseate tern	116.5381	-20.4778	1990
Sterna dougallii	Sterna	dougallii	roseate tern	116.6393	-20.4388	1990
Sterna dougallii	Sterna	dougallii	roseate tern	116.6737	-20.4485	1990
Sterna dougallii	Sterna	dougallii	roseate tern	116.5079	-20.4995	1990
Sterna dougallii	Sterna	dougallii	roseate tern	116.5936	-20.4817	1990
Sterna dougallii	Sterna	dougallii	roseate tern	116.6943	-20.5202	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6343	-20.5843	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.5936	-20.4817	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.8494	-20.4843	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.8388	-20.416	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.538	-20.5352	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6737	-20.4482	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.5389	-20.5356	1994
Sterna dougallii	Sterna	dougallii	roseate tern	116.6732	-20.4512	1994
Sterna dougallii	Sterna	dougallii	roseate tern	116.8806	-20.3881	1998
Sterna dougallii	Sterna	dougallii	roseate tern	116.5389	-20.5356	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.6732	-20.4512	0
Sterna dougallii	Sterna	dougallii	roseate tern	116.5013	-20.4987	1981
Sterna dougallii	Sterna	dougallii	roseate tern	116.5847	-20.582	1981
Sterna dougallii	Sterna	dougallii	roseate tern	116.7513	-20.582	1981
Sterna dougallii	Sterna	dougallii	roseate tern	116.7513	-20.4153	1981
Sterna dougallii	Sterna	dougallii	roseate tern	116.7513	-20.582	1979
Sterna dougallii	Sterna	dougallii	roseate tern	116.5847	-20.4153	1979
Sterna dougallii	Sterna	dougallii	roseate tern	116.5847	-20.582	1979
Sterna dougallii	Sterna	dougallii	roseate tern	116.7513	-20.582	1979
Sterna dougallii	Sterna	dougallii	roseate tern	116.918	-20.4153	1979
Sterna hirundo	Sterna	hirundo	Common Tern	116.4444	-20.6572	1990
Sterna hirundo	Sterna	hirundo	Common Tern	116.5194	-20.6069	1990
Sterna hirundo	Sterna	hirundo	Common Tern	116.5389	-20.5356	1990
Sterna hirundo	Sterna	hirundo	Common Tern	116.8317	-20.3889	1990
Sterna hirundo	Sterna	hirundo	Common Tern	116.6343	-20.5843	1990
Sterna hirundo	Sterna	hirundo	Common Tern	116.4456	-20.6489	2000
Sterna hirundo	Sterna	hirundo	common tern	116.5758	-20.6397	2000
Sterna hirundo	Sterna	hirundo	common tern	116.4814	-20.6461	2000
Sterna hirundo	Sterna	hirundo	common tern	116.4456	-20.6489	2000
Sternula albifrons	Sternula	albifrons	little tern	116.58	-20.58	2010
Sternula albifrons	Sternula	albifrons	little tern	116.8064	-20.4931	2014
Sternula nereis nereis	Sternula	nereis	fairy tern	116.432	-20.6537	1991
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8044	-20.3856	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8044	-20.3856	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.866	-20.383	1918
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5	-20.5	1974
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8056	-20.3858	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.4313	-20.6537	1991
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8317	-20.3889	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5381	-20.4778	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.675	-20.5178	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6737	-20.4485	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6732	-20.4512	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5079	-20.4995	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6149	-20.5694	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6283	-20.4564	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.654	-20.5059	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.4444	-20.6572	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5381	-20.4778	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5929	-20.5894	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5389	-20.5356	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5079	-20.4995	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5671	-20.4849	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5671	-20.4849	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6149	-20.5694	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6737	-20.4485	1979
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6149	-20.5694	1984
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8064	-20.4931	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8597	-20.4044	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8494	-20.4843	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.4444	-20.6572	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5194	-20.6069	1990

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5389	-20.5356	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5381	-20.4778	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6283	-20.4564	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.675	-20.5178	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5079	-20.4995	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6343	-20.5843	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.432	-20.6537	1991
Sternula nereis nereis	Sternula	nereis	fairy tern	116.654	-20.5059	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8317	-20.3889	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6737	-20.4485	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8597	-20.4044	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.4313	-20.6537	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5936	-20.4817	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.6149	-20.5694	1990
Sternula nereis nereis	Sternula	nereis	fairy tern	116.654	-20.5059	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8317	-20.3889	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.5936	-20.4817	2004
Sternula nereis nereis	Sternula	nereis	fairy tern	116.4444	-20.6572	1918
Sternula nereis nereis	Sternula	nereis	fairy tern	116.8056	-20.3858	0
Sternula nereis nereis	Sternula	nereis	fairy tern	116.4313	-20.6537	0
Sula leucogaster	Sula	leucogaster	brown booby	116.8056	-20.3858	0
Sula leucogaster	Sula	leucogaster	brown booby	116.6737	-20.4485	1979
Sula leucogaster	Sula	leucogaster	brown booby	116.6732	-20.4512	1979
Sula leucogaster	Sula	leucogaster	brown booby	116.7273	-20.533	1983
Sula leucogaster	Sula	leucogaster	brown booby	116.6861	-20.5284	1983
Sula leucogaster	Sula	leucogaster	brown booby	116.6641	-20.5354	1983
Sula leucogaster	Sula	leucogaster	brown booby	116.6799	-20.617	1983
Sula leucogaster	Sula	leucogaster	brown booby	116.6737	-20.4485	1979
Sula leucogaster	Sula	leucogaster	brown booby	116.6737	-20.4485	1979
Sula leucogaster	Sula	leucogaster	brown booby	116.6737	-20.4485	1980
Sula leucogaster	Sula	leucogaster	brown booby	116.8075	-20.3877	1984
Sula leucogaster	Sula	leucogaster	brown booby	116.7454	-20.4188	1984
Sula leucogaster	Sula	leucogaster	brown booby	116.6737	-20.4485	0
Sula leucogaster	Sula	leucogaster	brown booby	116.7513	-20.4153	1980
Sula leucogaster	Sula	leucogaster	brown booby	116.7513	-20.582	1980
Sula leucogaster	Sula	leucogaster	brown booby	116.7513	-20.582	1980
Sula leucogaster	Sula	leucogaster	brown booby	116.7513	-20.4153	1981
Sula leucogaster	Sula	leucogaster	brown booby	116.5847	-20.4153	1978
Sula leucogaster	Sula	leucogaster	brown booby	116.5847	-20.4153	1979
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5758	-20.6397	2000
Thalasseus bergii	Thalasseus	bergii	crested tern	116.8202	-20.5862	1999
Thalasseus bergii	Thalasseus	bergii	crested tern	116.8124	-20.5903	1999
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5822	-20.4745	1999
Thalasseus bergii	Thalasseus	bergii	crested tern	116.6675	-20.5203	2002
Thalasseus bergii	Thalasseus	bergii	crested tern	116.6675	-20.5203	2002
Thalasseus bergii	Thalasseus	bergii	crested tern	116.8347	-20.6653	2002
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7922	-20.5826	1999
Thalasseus bergii	Thalasseus	bergii	crested tern	116.8105	-20.6059	1999
Thalasseus bergii	Thalasseus	bergii	crested tern	116.8105	-20.6059	1999
Thalasseus bergii	Thalasseus	bergii	crested tern	116.8513	-20.4487	2005
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5847	-20.5833	2010
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7047	-20.6662	2010
Thalasseus bergii	Thalasseus	bergii	crested tern	116.6283	-20.4603	2011
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7983	-20.6339	2011
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7972	-20.6331	1999
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5013	-20.4987	1981
Thalasseus bergii	Thalasseus	bergii	crested tern	116.918	-20.4153	1980
Thalasseus bergii	Thalasseus	bergii	crested tern	116.8347	-20.4153	1980
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7513	-20.582	1980
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5847	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7513	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7513	-20.4153	1981
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5847	-20.4153	1981
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7513	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern	116.7513	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5847	-20.4153	1979
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5847	-20.582	1979
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5847	-20.4153	1979
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5847	-20.582	1979
Thalasseus bergii	Thalasseus	bergii	crested tern	116.5013	-20.4987	1980
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5	-20.5	1977
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5	-20.5	1966
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5	-20.5	1974
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5	-20.5	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.58	-20.58	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6583	-20.525	1999
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6667	-20.5194	2000
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8056	-20.3858	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6592	-20.6094	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6283	-20.4564	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.675	-20.5178	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6343	-20.5843	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.7768	-20.5405	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5194	-20.6069	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5417	-20.5368	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.654	-20.5059	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8494	-20.4843	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5194	-20.6069	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5194	-20.6069	1984

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5194	-20.6069	1984
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8056	-20.3858	1984
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8056	-20.3858	1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.7768	-20.5405	1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8494	-20.4843	1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5194	-20.6069	1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.5389	-20.5356	1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8806	-20.3881	1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.675	-20.5178	1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6583	-20.525	1999
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6667	-20.5194	2000
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8494	-20.4843	1978
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8064	-20.4931	2014
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.654	-20.5059	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.6283	-20.4564	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler	116.8806	-20.3881	1998
Tringa glareola	Tringa	glareola	wood sandpiper	116.5	-20.5	1977
Tringa glareola	Tringa	glareola	wood sandpiper	116.5	-20.5	1977
Tringa glareola	Tringa	glareola	wood sandpiper	116.5013	-20.4987	1977
Tringa glareola	Tringa	glareola	wood sandpiper	116.5013	-20.4987	1977
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1980
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1966
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1978
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1977
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1980
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1981
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1983
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5	-20.5	1977
Tringa nebularia	Tringa	nebularia	common greenshank,	116.58	-20.58	0
Tringa nebularia	Tringa	nebularia	common greenshank,	116.85	-20.45	2005
Tringa nebularia	Tringa	nebularia	common greenshank,	116.6225	-20.4697	0
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5194	-20.6069	1983
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5194	-20.6069	1990
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5936	-20.4817	1990
Tringa nebularia	Tringa	nebularia	common greenshank,	116.6343	-20.5843	1990
Tringa nebularia	Tringa	nebularia	common greenshank,	116.8494	-20.4843	1978
Tringa nebularia	Tringa	nebularia	common greenshank,	116.6225	-20.4697	1981
Tringa nebularia	Tringa	nebularia	common greenshank,	116.8806	-20.3881	1998
Tringa nebularia	Tringa	nebularia	common greenshank,	116.8347	-20.6653	2002
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7597	-20.6403	1999
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7819	-20.5903	1999
Tringa nebularia	Tringa	nebularia	common greenshank,	116.8513	-20.4487	2005
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7047	-20.6662	2010
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5013	-20.4987	1981
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5847	-20.582	1980
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5847	-20.4153	1980
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7513	-20.582	1980
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7513	-20.4153	1980
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5847	-20.4153	1981
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7513	-20.582	1981
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7513	-20.582	1981
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5847	-20.582	1981
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5013	-20.4987	1978
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5013	-20.4987	1977
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5013	-20.4987	1978
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7513	-20.582	1979
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5013	-20.4987	1977
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5013	-20.4987	1979
Tringa nebularia	Tringa	nebularia	common greenshank,	116.7513	-20.582	1979
Tringa nebularia	Tringa	nebularia	common greenshank,	116.5013	-20.4987	1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl	116.5	-20.5	1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl	116.5	-20.5	1977
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl	116.5	-20.5	1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl	116.5	-20.5	1966
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl	116.5013	-20.4987	1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl	116.5013	-20.4987	1977
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl	116.5013	-20.4987	1979
Xenus cinereus	Xenus	cinereus	Terek sandpiper	116.5	-20.5	1977
Xenus cinereus	Xenus	cinereus	Terek sandpiper	116.5	-20.5	1981
Xenus cinereus	Xenus	cinereus	Terek sandpiper	116.8268	-20.4836	2015
Xenus cinereus	Xenus	cinereus	Terek sandpiper	116.8215	-20.5195	2015
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.5381	-20.4778	1983
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.4593	-20.631	1983
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.4814	-20.6461	2000
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.5013	-20.4987	1978
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.5013	-20.4987	1977
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.7513	-20.582	1978
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.7513	-20.582	1979
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.5013	-20.4987	1977
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.7513	-20.582	1979
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te	116.5013	-20.4987	1980
Gelochelidon nilotica	Gelochelidon	nilotica	gull-billed tern	116.8494	-20.4843	1990
Gelochelidon nilotica	Gelochelidon	nilotica	gull-billed tern	116.5194	-20.6069	1990
Gelochelidon nilotica	Gelochelidon	nilotica	gull-billed tern	116.5	-20.5	1980
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6247	-20.6665	1988
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5381	-20.4778	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6732	-20.4512	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5936	-20.4817	1981
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6169	-20.4441	1991

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1991
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1982
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1992
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6247	-20.6665	1991
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5381	-20.4778	1991
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6732	-20.4512	1991
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1981
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6396	-20.4392	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6737	-20.4485	1980
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6732	-20.4512	1980
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5079	-20.4995	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1982
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5381	-20.4778	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.8056	-20.3858	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1984
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5079	-20.4995	1984
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6737	-20.4485	1980
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6743	-20.4475	1984
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6393	-20.4388	1984
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.8056	-20.3858	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.8597	-20.4044	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.8317	-20.3889	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6393	-20.4388	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6737	-20.4485	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5079	-20.4995	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6737	-20.4485	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1991
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1981
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1994
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1984
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1994
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6247	-20.6665	1994
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6247	-20.6665	1988
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5381	-20.4778	1984
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6732	-20.4512	1991
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6732	-20.4512	1983
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5936	-20.4817	1977
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6247	-20.6665	1991
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1988
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5381	-20.4778	1990
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	1984
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.8806	-20.3881	1998
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6169	-20.4441	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6225	-20.4697	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5389	-20.5356	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6247	-20.6665	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5381	-20.4778	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6283	-20.4564	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.6732	-20.4512	0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern	116.5936	-20.4817	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6251	-20.4707	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6251	-20.4707	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5379	-20.4785	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5379	-20.4785	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6292	-20.4571	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6292	-20.4571	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.8044	-20.3856	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6168	-20.4438	1991
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5327	-20.5428	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6742	-20.5151	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6742	-20.5151	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6742	-20.5151	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6742	-20.5151	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5473	-20.5379	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.538	-20.5352	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6251	-20.4707	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6251	-20.4707	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6742	-20.5151	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5379	-20.4785	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.538	-20.5352	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.4449	-20.6588	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.538	-20.5352	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.538	-20.5352	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.777	-20.5399	0

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.777	-20.5399	1982
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.506	-20.5002	1974
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6667	-20.5194	2000
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.86	-20.38	1962
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6169	-20.4441	1991
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.4444	-20.6572	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5479	-20.5379	1978
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1988
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.8056	-20.3858	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	1982
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1991
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5327	-20.5428	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.4444	-20.6572	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6796	-20.5419	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5079	-20.4995	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5327	-20.5428	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.654	-20.5059	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5079	-20.4995	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.8056	-20.3858	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.4449	-20.6588	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.538	-20.5352	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6742	-20.5151	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.777	-20.5399	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6251	-20.4707	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5379	-20.4785	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6292	-20.4571	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6168	-20.4438	1991
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5327	-20.5428	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6169	-20.4441	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.654	-20.5059	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5473	-20.5379	1977
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6169	-20.4441	1991
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.4444	-20.6572	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5479	-20.5379	1978
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1994
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1994
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1982
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1983
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1992
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1978
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.8056	-20.3858	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	1990

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.8806	-20.3881	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5079	-20.4995	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.654	-20.5059	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6796	-20.5419	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.4444	-20.6572	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.8806	-20.3881	1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6169	-20.4441	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.8056	-20.3858	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.7768	-20.5405	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.4444	-20.6572	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5479	-20.5379	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6225	-20.4697	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5327	-20.5428	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5389	-20.5356	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.5381	-20.4778	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.6283	-20.4564	0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearwa	116.675	-20.5178	0

APPENDIX C: PROTECTED MATTERS SEARCH TOOL EPBC DATABASE RECORDS (100 KM & 5 KM BUFFERS)

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

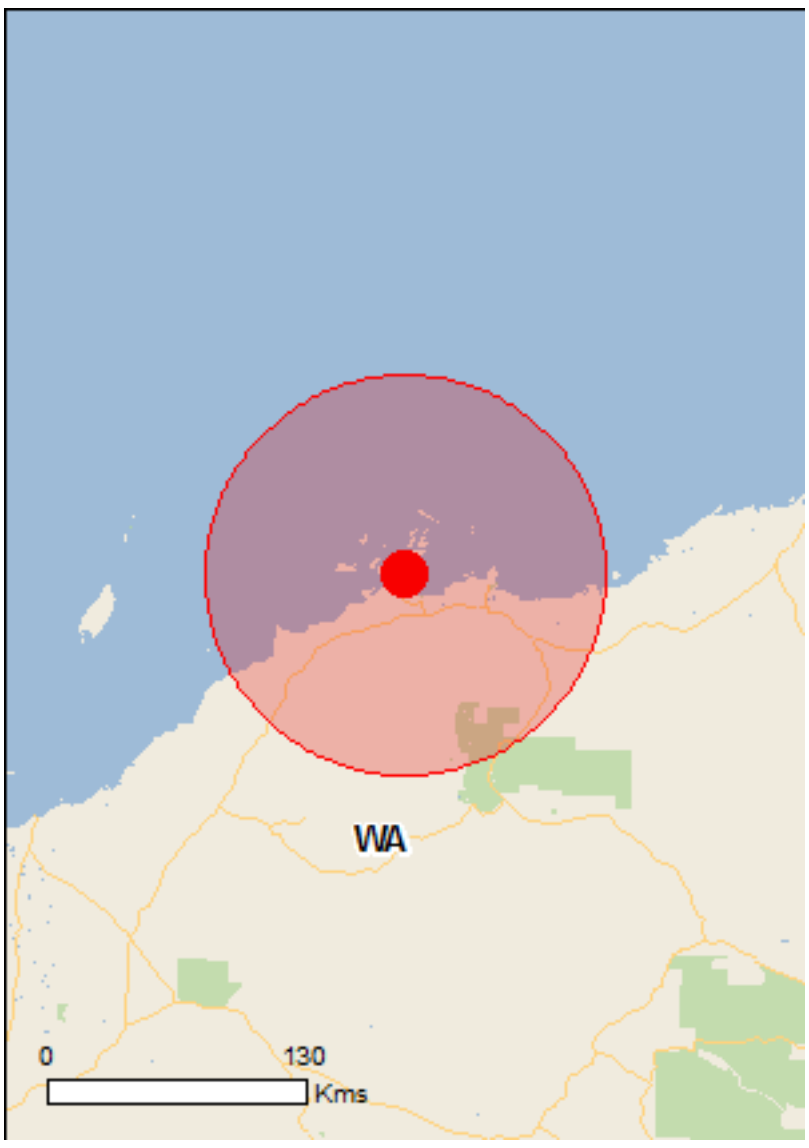
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 13/11/18 16:13:09

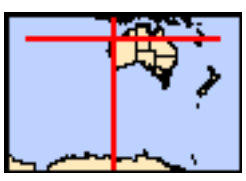
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 100.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	66

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	113
Whales and Other Cetaceans:	16
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	4

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	9
Regional Forest Agreements:	None
Invasive Species:	19
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

National Heritage Properties [Resource Information]

Name	State	Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus angusticeps Northwestern Coastal Ctenotus, Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Lerista nevinae		
Nevin's Slider [85296]	Endangered	Species or species habitat known to occur within area
Liasis olivaceus barroni		
Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia		
Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus		
Bridled Tern [82845]		Breeding known to occur within area
Sterna dougallii		
Roseate Tern [817]		Breeding likely to occur

Name	Threatened	Type of Presence within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence within area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
[Charadrius veredus](#) Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
[Glareola maldivarum](#) Oriental Pratincole [840]		Species or species habitat known to occur within area
[Limicola falcinellus](#) Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area
[Limosa limosa](#) Black-tailed Godwit [845]		Species or species habitat known to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
[Numenius phaeopus](#) Whimbrel [849]		Species or species habitat known to occur within area
[Pandion haliaetus](#) Osprey [952]		Breeding known to occur within area
[Phalaropus lobatus](#) Red-necked Phalarope [838]		Species or species habitat known to occur within area
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Species or species habitat known to occur within area
[Pluvialis squatarola](#) Grey Plover [865]		Species or species habitat known to occur within area
[Thalasseus bergii](#) Crested Tern [83000]		Breeding known to occur within area
[Tringa brevipes](#) Grey-tailed Tattler [851]		Species or species habitat known to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
[Tringa totanus](#) Common Redshank, Redshank [835]		Species or species habitat known to occur within area
[Xenus cinereus](#) Terek Sandpiper [59300]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - KARRATHA TRAINING DEPOT

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Australian Marine Parks	[Resource Information]
Name	Label
Dampier	Habitat Protection Zone (IUCN IV)
Dampier	Multiple Use Zone (IUCN VI)
Dampier	National Park Zone (IUCN II)
Montebello	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Millstream Chichester	WA
Murujuga	WA
Unnamed WA36907	WA
Unnamed WA36909	WA
Unnamed WA36910	WA
Unnamed WA36913	WA
Unnamed WA36915	WA
Unnamed WA38287	WA
Unnamed WA40877	WA

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat known to occur within area

Key Ecological Features (Marine)

[Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Glomar Shoals	North-west

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-20.62919 116.77412

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

© Commonwealth of Australia
Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

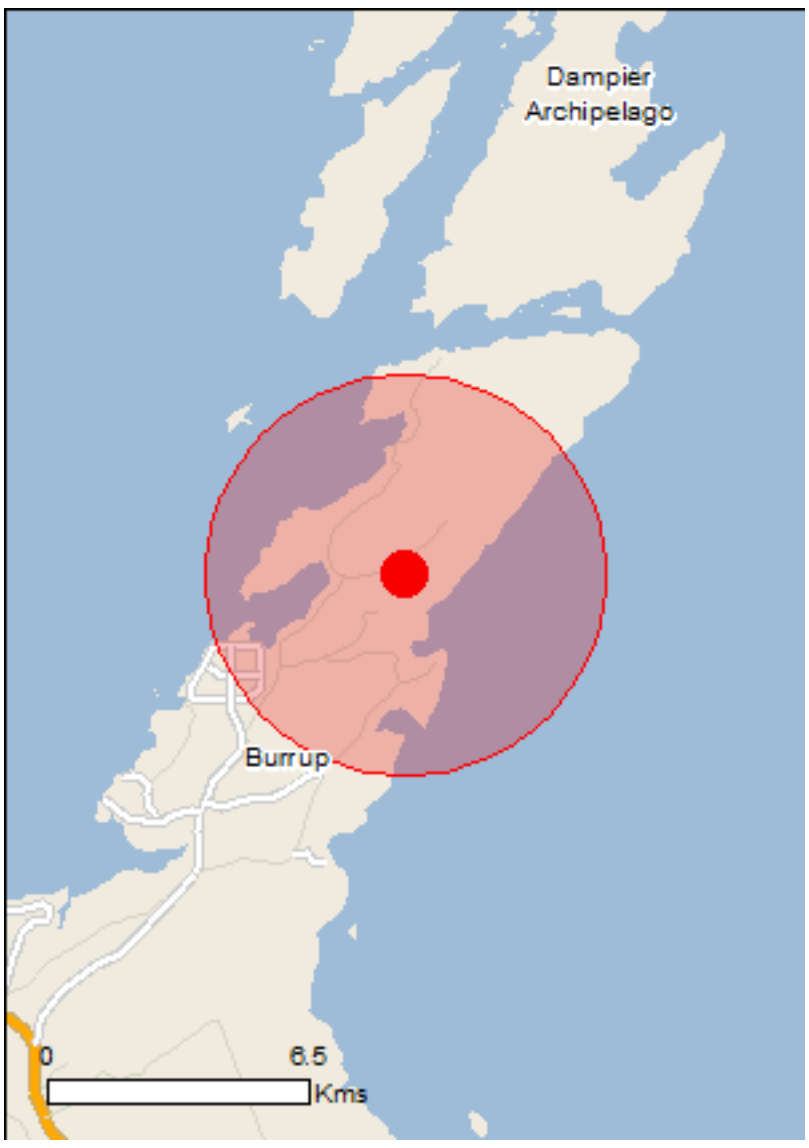
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

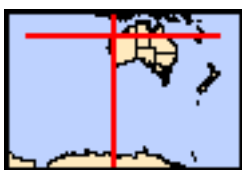
Report created: 20/11/18 13:00:48

Summary
Details
Matters of NES
Other Matters Protected by the EPBC Act
Extra Information
Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	28
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	75
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Macrotis lagotis		
Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form)		
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aipysurus apraefrontalis		
Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus angusticeps		
Northwestern Coastal Ctenotus, Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni		
Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat may occur within area
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Sterna dougallii](#) Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
[Anoxypristis cuspidata](#) Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
[Dugong dugon](#) Dugong [28]		Species or species habitat known to occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
[Manta alfredi](#) Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
[Manta birostris](#) Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Murujuga	WA

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-20.57361 116.815

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

© Commonwealth of Australia
Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX D: DEPARTMENT OF BIODIVERSITY CONSERVATION AND ATTRACTIONS DATABASE SEARCH RESULTS FOR THREATENED AND PRIORITY FLORA, ECOLOGICAL COMMUNITIES AND FAUNA

Taxon	Cons_Code	Locality	Latitude	Longitude	Date
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	1	1 km S of Onslow	-21.68333333	115.1333333	3/08/1963
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	1	Rear Roebourne Oval	-20.66666667	117.15	/08/1982
Atriplex lindleyi subsp. conduplicata	3	Ca 10 km WNW from Karratha Homestead, on main road reserve of Coastal Highway adjacent to circular regeneration pond Karratha Station	-20.85055556	116.5519444	7/11/1996
Carpobrotus sp. Thevenard Island (M. White 050)	3	Thevenard Island between Saladin 4 and jetty area	-21.46319444	115.0196	24/08/1990
Carpobrotus sp. Thevenard Island (M. White 050)	3	Thevenard Island. 500 m from south beach 250 m SW windsock	-21.46666667	115.0166667	23/06/1988
Corchorus congener	3	Barrow Island	-20.88305556	115.3266667	21/11/1965
Corchorus congener	3	Barrow Island	-20.76666667	115.4	/10/1980
Corchorus congener	3	Barrow Island	-20.76666667	115.4	/10/1980
Corchorus congener	3	Barrow Island	-20.88305556	115.3266667	29/04/1964
Corchorus congener	3	Between road and S84 cave on Barrow Island,	-20.76666667	115.4	4/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	Barrow Island	-20.80199897	115.449625	1/10/2015
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	Barrow Island	-20.76666667	115.4	/10/1980
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	75 m E of turnoff to R33 on S side of road on Barrow Island	-20.78333333	115.3333333	5/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	Barrow Island, off the NW coast	-20.88305556	115.3266667	/06/1964
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	8,300 metres W of Campsite, Barrow Island	-20.88305556	115.3266667	26/06/1964
Eleocharis papillosa	3	Site: 567_BES622. 17.6 SSE of Onslow, 102 km W of Nanutarra Roadhouse and 124 km NW of Barradale Roadhouse	-21.738935	114.979944	14/03/2011
Eragrostis lanicaulis	3	Near Point Sampson [Samson]	-20.62972222	117.1897222	/03/1921
Eragrostis lanicaulis	3	Near Point Sampson [Samson]	-20.62972222	117.1897222	/03/1921
Eragrostis surreyana	3	Site B233, Burrup Peninsula 5 km NE of North West Shelf Gasworks, Pilbara Bioregion	-20.566933	116.823335	27/06/2000
Eragrostis surreyana	3	Wetland above waterfall, Burrup Peninsula. (Trudgen & Associates Burrup Vegetation Survey Site B233)	-20.56538889	116.8237778	27/05/2009
Eragrostis surreyana	3	Waterhole above waterfall: Burrup Peninsula	-20.56552778	116.824	27/05/2009
Eremophila forrestii subsp. viridis	3	Ca 30 km SW of Onslow, Pilbara	-21.77557918	115.0539952	19/08/2009
Eremophila forrestii subsp. viridis	3	10 miles S of Onslow	-21.78277778	115.1116667	28/08/1960
Gomphrena cuculLata	3	North West Coastal Highway, 35 km S of Karratha	-20.8619	116.58295	11/07/2004
Gomphrena leptophylla	3	North West Coastal Highway, 35 km S of Karratha	-20.8619	116.58295	11/07/2004
Goodenia nuda	4	By side of management track on Mardie Station	-21.10981887	115.9935363	31/07/2002
Goodenia pallida	1	127 miles from Onslow on Roebourne road,	-20.83333333	116.5	11/08/1970
Gymnanthera cunninghamii	3	West Lewis Island, Dampier Archipelago	-20.59472222	116.6113889	13/06/1962
Gymnanthera cunninghamii	3	Enderby's Island, Dampier Archipelago	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3	Enderby's Island, Dampier Archipelago	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3	Enderby Island, W end, near Rocky Headland	-20.605	116.4833333	13/05/1982
Gymnanthera cunninghamii	3	Enderby Island, S side, Fortescue Botanical District	-20.6	116.4833333	2/09/1987
Helichrysum oligochaetum	1	Port Walcott	-20.66	117.18	//
Helichrysum oligochaetum	1	Port Walcott, ca 10 km N of Roebourne	-20.65	117.1833333	//
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	Site: DRW14, 6.4 km S of White Peak, 8.2 km N of Mt Regal, 8.7 km SSE of Dampier, Karratha Station, Pilbara IBRA	-20.74444	116.74772	21/08/2005
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	Site: DRW16, 17.1 km ENE of Yerwararron Hill, 17.5 km WNW of Mt Regal, 18.8 km SW of Dampier, Karratha Station, Pilbara IBRA	-20.80192	116.58086	21/08/2005
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	Site: DRC13, 5.7 km NE of Mt Regal, 13.4 km SSE of White Peak, 8.1 km SW of Karratha, Pilbara IBRA	-20.79114	116.79464	11/09/2004
Owenia acidula	3	Mardi Station	-21.18333333	115.9833333	//
Owenia acidula	3	Mardie Station	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	Mardie Station	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	Mardie Station	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	Mardie Station	-21.18333333	115.9833333	19/08/1966
Owenia acidula	3	Mardie	-21.18666667	115.9816667	5/03/1953
Pentalepis trichodesmoides subsp. hispida	2	45 km peg, NW Gas Pipeline	-20.63333333	117.2	8/10/1992
Rhynchosia bungarensis	4	900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	0.77 km WSW from the intersection of Cinders Road and Dampier Road, 3.54 km SSE of Dampier and 13.41 km NW of Karratha	-20.69025	116.727778	30/11/2010
Rhynchosia bungarensis	4	Waterhole above waterfall, Burrup Peninsula	-20.56552778	116.824	27/05/2009
Rhynchosia bungarensis	4	Deep Gorge, Burrup Peninsula, N of Karratha	-20.63722222	116.788	26/05/2009
Rhynchosia bungarensis	4	Burrup Peninsula, waterhole above waterfall	-20.56552778	116.824	27/05/2009
Rhynchosia bungarensis	4	Burrup Peninsula, dry creekbed crossing near waterfall area	-20.57205556	116.8086111	27/05/2009
Rhynchosia bungarensis	4	3.75 km along Burrup Road from Karratha - Dampier Road; ca 500 m in from road on top of rockpile	-20.64794444	116.7592778	29/05/2009
Rhynchosia bungarensis	4	West Lewis Island, Dampier Archipelago	-20.59472222	116.6113889	14/06/1962
Rhynchosia bungarensis	4	Dolphin Island, Dampier Archipilago	-20.50805556	116.84	5/06/1962
Rhynchosia bungarensis	4	One Shack Bay; East Lewis Island	-20.63333333	116.6333333	9/11/1987
Rhynchosia bungarensis	4	NE end of Enderby Island, Dampier Archipelago	-20.6	116.5166667	19/07/1980
Rhynchosia bungarensis	4	900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	Site D013, 3.65 km NNE along the coast from the southern tip of Dolphin Island, Dampier Archipelago, Pilbara Bioregion	-20.487416	116.832863	29/05/2000
Rhynchosia bungarensis	4	900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	1.9 km ENE of the SW tip of Dolphin Island and 300 m from the west coast, Site D088, Dampier Archipelago, Pilbara Bioregion	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4	1.9 km ENE of the SW tip of Dolphin Island and 300 m from the west coast, Site D088, Dampier Archipelago, Pilbara Bioregion	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4	Site B235. 600 m E of the inner corner of Withnell Bay, Pilbara Bioregion	-20.574043	116.805097	26/06/2000
Rhynchosia bungarensis	4	2.6 km NE of the inner end of King Bay, Burrup Peninsula, Site B028, Pilbara Bioregion	-20.61269	116.782273	22/05/2000
Rhynchosia bungarensis	4	Site B076, NW part of the Burrup Peninsula, 600 m NE of the N corner of Conzinc Bay	-20.534969	116.819554	27/05/2000

Taxon	Cons_Code	Locality	Latitude	Longitude	Date
Rhynchosia bungarensis	4	Site B064, Burrup Peninsula, Pilbara Bioregion, west coast, adjacent to Holden Beach, between Dampier Port and NW Shelf Gas Works	-20.606376	116.756965	26/05/2000
Rhynchosia bungarensis	4	Site B074, N of Conzinc Bay and 11.2 km ESE of the NW tip of the Burrup Peninsula, Pilbara Bioregion	-20.533712	116.819134	27/05/2000
Rhynchosia bungarensis	4	Site B062, 1.5 km almost due S of Holden Poiint between Dampier Port and North West Shelf Gas plant (on E side of road), Burrup Peninsula, Pilbara Bioregion	-20.615432	116.758045	26/05/2000
Rhynchosia bungarensis	4	Site B066, 1.2 km S of the point near the centre of the end of the Burrup Peninsula, Pilbara Bioregion	-20.533695	116.838079	27/05/2000
Rhynchosia bungarensis	4	Site B066, 1.2 km S of the point near the centre of the end of the Burrup Peninsula, Pilbara Bioregion	-20.533695	116.838079	27/05/2000
Rhynchosia bungarensis	4	Site B193, 2.5 km ENE of the inner end of Withnell Bay, Burrup Peninsula, Pilbara Bioregion	-20.566045	116.82089	5/06/2000
Rhynchosia bungarensis	4	Site B052, 1.74 km ENE of Mt Burrup and 160 m from the E coast of the Burrup Peninsula, Pilbara Bioregion	-20.549081	116.844855	25/05/2000
Rhynchosia bungarensis	4	Site B003, 1.6 km SW of the inner end of King Bay, Burrup Peninsula, Pilbara Bioregion	-20.640271	116.777358	20/05/2000
Rhynchosia bungarensis	4	Site B040, 900 m slightly W of N of Mt Burrup, Burrup Peninsula, Pilbara Bioregion	-20.546327	116.828242	25/05/2000
Rhynchosia bungarensis	4	Site B007, 1.34 km WSW of the southern corner of Hearson Cove, Burrup Peninsula, Pilbara Bioregion	-20.638945	116.786661	20/05/2000
Rhynchosia bungarensis	4	Pistol Range ENE Of Telstra tower, Burrup Peninsula, Site B183, Pilbara Bioregion	-20.665256	116.745265	3/06/2000
Rhynchosia bungarensis	4	Site BO20. 1.7 km SSE of inner end of King Bay, Burrup Peninsula, Pilbara Bioregion	-20.645762	116.761779	21/05/2000
Rhynchosia bungarensis	4	Site B091, White Hill, Pilbara Bioregion S of Dampier Road, NW corner of Dampier Salt lease on W facing exposed slope	-20.69183	116.721464	28/05/2000
Rhynchosia bungarensis	4	1.94 km slightly W of the S of the inner end of King Bay, Site B017, Burrup Peninsula, Pilbara Bioregion	-20.648958	116.759739	21/05/2000
Rhynchosia bungarensis	4	Site B195, 2.25 km ENE of the SE corner of Withnell Bay and 1.5 km inland from the E coast of the Burrup Peninsula, Pilbara Bioregion	-20.566793	116.819181	5/06/2000
Rhynchosia bungarensis	4	Site B031, NE part of Burrup Peninsula, 3.7 km from NE point and 0.6 km from east coast (near Mt Burrup)	-20.548369	116.837843	25/05/2000
Rhynchosia bungarensis	4	Near quadrant on cutting along road to Con. camp; Burrup Peninsula	-20.78333333	116.7666667	21/09/1983
Rhynchosia bungarensis	4	Cape Preston	-21.04651731	116.2398665	7/06/2017
Schoenus punctatus	3	Burrup Peninsula	-20.56589139	116.8235573	10/07/1999
Stackhousia clementii	3	King Bay - Hearson Cove tidal inlet, Burrup Peninsula	-20.63026737	116.784159	30/04/2002
Stackhousia clementii	3	On 7 Mile Flats, 8.4 km SE of Dampier, 9.4 km W of Karratha	-20.72520548	116.7560462	24/02/2013
Stackhousia clementii	3	5.4 km S of Onslow, 35.4 km NNE of Minderoo Homestead and 79.6 km W of Yarraloola Homestead	-21.68456	115.118028	30/08/2011
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	32.1 km E-NE of Karratha town site	-20.652806	117.133444	7/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	34.9 km NE of Karratha town site	-20.621222	117.150917	9/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	34.1 km NE of Karratha town site	-20.624361	117.143611	10/03/2008
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	35 km NE of Karratha town site	-20.616417	117.150972	5/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	W of track to Sams Creek, c. 1.5 km W of Point Samson, c. 5 km NE of Wickham	-20.62675509	117.1810431	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	C. 2 km S of Anketell Point, c. 5 km NW of Wickham	-20.64340538	117.0941985	3/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	C. 2.5 km SW of Cape Lambert Port. C. 6 km N of Wickham	-20.62334288	117.1491159	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	C. 2.5 km S of Cape Lambert Port. C. 5.5 km NNE of Wickham	-20.6213672	117.1654401	3/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	Ca 2.5 km SW of Cape Lambert Port, ca 6 km N of Wickham	-20.62334288	117.1491159	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	Sams Creek, Point Samson	-20.62972222	117.1897222	/08/1984
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	Pt Samson	-20.63333333	117.2	8/10/1992
Terminalia supranitifolia	3	Base hills right hand side Dampier Island, near right hand side of Dampier Salt Ltd lease.	-20.66666667	116.7	/12/1986
Terminalia supranitifolia	3	Site 1, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.67040184	116.7569983	2/11/1998
Terminalia supranitifolia	3	Site 12, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64153748	116.796257	12/11/1998
Terminalia supranitifolia	3	Site 13, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.6359749	116.7917049	15/11/1998
Terminalia supranitifolia	3	King Bay - Withnell Bay Road, peninsula between Dampier and Dolphin Island.	-20.63333333	116.75	6/12/1978
Terminalia supranitifolia	3	Burrup Peninsula, Pistol Ranges, S of Hearson Cove Road	-20.63597546	116.7916969	15/11/1998
Terminalia supranitifolia	3	Burrup Peninsula, Pistol Ranges, S of Hearson Cove Road	-20.64153102	116.7962525	12/11/1998
Terminalia supranitifolia	3	Burrup Peninsula, Pistol Ranges, S of Hearson Cove Road	-20.67039265	116.7570029	2/11/1998
Terminalia supranitifolia	3	Site 11, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.63861588	116.7937555	10/11/1998
Terminalia supranitifolia	3	Site 20, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64257507	116.7732557	26/11/1998
Terminalia supranitifolia	3	Site 21, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65113121	116.7725423	26/11/1998
Terminalia supranitifolia	3	Hearson's cove beach	-20.63333333	116.8	11/03/1983
Terminalia supranitifolia	3	Hearson's cove beach	-20.63333333	116.8	11/03/1983
Terminalia supranitifolia	3	Hearson's cove beach	-20.63333333	116.8	11/03/1983
Terminalia supranitifolia	3	Burrup Peninsula	-20.78333333	116.7666667	10/02/1982
Terminalia supranitifolia	3	Near Dampier	-20.66666667	116.75	21/07/2004
Terminalia supranitifolia	3	1.8 miles from Dampier on road to Hearson Cove, Nickol Bay	-20.66666667	116.7	/12/1971
Terminalia supranitifolia	3	Site 18, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65430143	116.7784031	24/11/1998
Terminalia supranitifolia	3	Site 6, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65839632	116.7796453	5/11/1998
Terminalia supranitifolia	3	Site 19, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65611998	116.773226	24/11/1998
Terminalia supranitifolia	3	Site 17, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64520398	116.7798082	22/11/1998
Terminalia supranitifolia	3	Site 16. Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64068437	116.7785477	22/11/1998
Terminalia supranitifolia	3	Site 5, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.66687903	116.764387	28/11/1998
Terminalia supranitifolia	3	Site 2, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.66859454	116.7634242	2/11/1998
Terminalia supranitifolia	3	Site 3, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.66073537	116.7717119	3/11/1998
Terminalia supranitifolia	3	Site 22, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64303766	116.7677738	28/11/1998
Terminalia supranitifolia	3	Site 4, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65870665	116.7750463	3/11/1998
Terminalia supranitifolia	3	Site 10, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.63536052	116.7993944	10/11/1998
Terminalia supranitifolia	3	Rear of beach, Hearson Cove	-20.63333333	116.8	/05/1983
Terminalia supranitifolia	3	Site 7, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65249621	116.7871513	8/11/1998
Terminalia supranitifolia	3	Site 9, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65143609	116.7921831	8/11/1998
Terminalia supranitifolia	3	Site 15, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.63373596	116.7859391	20/11/1998
Terminalia supranitifolia	3	Site 14, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64244207	116.78226	20/11/1998
Terminalia supranitifolia	3	Site 8, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64676249	116.7832234	18/11/1998
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	3	10km W of Karratha on road to Dampier opp & Mile Railway sheds on E side of road	-20.72916667	116.7622222	20/08/1992
Triumfetta echinata	3	Ca 16 km S-SW of Onslow	-21.77707459	115.0853797	1/11/2009
Triumfetta echinata	3	20 km E of Onslow	-21.63805556	115.3438889	25/10/1980
Triumfetta echinata	3	Ca 35 km NW from Peedamulla Homestead and 0.5 km back from sea, Peedamulla Station	-21.59972222	115.2938889	5/11/1996
Vigna triodiophila	3	Burrup Road between MOF Road and NorthWest Shelf, opposite Pluto Site ca 500 m from Withnell Bay Road, E side Burrup - Burrup Peninsula	-20.61416667	116.7752778	9/06/2011
Vigna triodiophila	3	Site B024, E of Burrup road at bend before North West Shelf gas plant	-20.609139	116.782	21/05/2000
Vigna triodiophila	3	1.7 km SE of the centre of King Bay, Burrup Peninsula, Pilbara Bioregion, Site B016	-20.648704	116.759173	21/05/2000
Vigna triodiophila	3	Site B025, Burrup Peninsula, ca 250 m indland from the East coast of Withnell Bay	-20.58063	116.79481	22/05/2000
Vigna triodiophila	3	3.75 km along Burrup Road from Karratha - Dampier Road; towards top of rockpile ca 500 m in from road	-20.64661469	116.7606137	29/05/2009
Vigna triodiophila	3	8.2 km along Cleaverville track from North West Coastal Highway, N of Karratha; Pilbara Biological Survey site BRC 11	-20.68711287	117.0081136	26/05/2009
Vigna triodiophila	3	Site B018. Burrup Peninsula, Pilbara Bioregion, 400 m SE of Burrup	-20.649002	116.75947	21/05/2000
Vigna triodiophila	3	On Pluto Lease, adjacent to and W side of Haul Road - Pluto (Burrup Industrial Area) Burrup Peninsula	-20.61074796	116.7630429	31/03/2011

COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUI	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID
Burrup Peninsula rock pile communities	Priority 1		1	P9		200	14928
Burrup Peninsula rock pile communities	Priority 1		1	P4		200	14923
Burrup Peninsula rock pile communities	Priority 1		1	P8		200	14927
Burrup Peninsula rock pile communities	Priority 1		1	P5		200	14924
Burrup Peninsula rock pile communities	Priority 1		1	P7		200	14926
Burrup Peninsula rock pile communities	Priority 1		1	P6		200	14925
Burrup Peninsula rock pile communities	Priority 1		1	P12		200	14930
Burrup Peninsula rock pile communities	Priority 1		1	P2		200	14921
Burrup Peninsula rock pile communities	Priority 1		1	P1		200	14920
Burrup Peninsula rock pile communities	Priority 1		1	P38		200	14955
Burrup Peninsula rock pile communities	Priority 1		1	P37(first)		200	14953
Burrup Peninsula rock pile communities	Priority 1		1	P30		200	14946
Burrup Peninsula rock pile communities	Priority 1		1	P31		200	14947
Burrup Peninsula rock pile communities	Priority 1		1	P25		200	14941
Burrup Peninsula rock pile communities	Priority 1		1	P35		200	14951
Burrup Peninsula rock pile communities	Priority 1		1	P22		200	102670
Burrup Peninsula rock pile communities	Priority 1		1	P23		200	14939
Burrup Peninsula rock pile communities	Priority 1		1	P24		200	14940
Burrup Peninsula rock pile communities	Priority 1		1	P16		200	14934
Burrup Peninsula rock pile communities	Priority 1		1	P15		200	14933
Burrup Peninsula rock pile communities	Priority 1		1	P18		200	14936
Burrup Peninsula rock pile communities	Priority 1		1	P44		200	14961
Burrup Peninsula rock pile communities	Priority 1		1	P63		200	14981
Burrup Peninsula rock pile communities	Priority 1		1	P59		200	14977
Burrup Peninsula rock pile communities	Priority 1		1	P49		200	14966
Burrup Peninsula rock pile communities	Priority 1		1	P50		200	14967
Burrup Peninsula rock pile communities	Priority 1		1	P58		200	14976
Burrup Peninsula rock pile communities	Priority 1		1	P60		200	14978
Burrup Peninsula rock pile communities	Priority 1		1	P61		200	14979
Burrup Peninsula rock pile communities	Priority 1		1	P51		200	14968
Burrup Peninsula rock pile communities	Priority 1		1	P56		200	14973
Burrup Peninsula rock pile communities	Priority 1		1	P52		200	14969
Burrup Peninsula rock pile communities	Priority 1		1	P53		200	14970
Burrup Peninsula rock pile communities	Priority 1		1	P54		200	14971
Burrup Peninsula rock pile communities	Priority 1		1	P41		200	14958
Burrup Peninsula rock pile communities	Priority 1		1	P10		200	14929
Burrup Peninsula rock pile communities	Priority 1		1	P13		200	14931
Burrup Peninsula rock pile communities	Priority 1		1	P3		200	14922
Burrup Peninsula rock pile communities	Priority 1		1	P39		200	14956
Burrup Peninsula rock pile communities	Priority 1		1	P47		200	14964
Burrup Peninsula rock pile communities	Priority 1		1	P46		200	14963
Burrup Peninsula rock pile communities	Priority 1		1	P48		200	14965
Burrup Peninsula rock pile communities	Priority 1		1	P43		200	14960
Burrup Peninsula rock pile communities	Priority 1		1	P34		200	14950
Burrup Peninsula rock pile communities	Priority 1		1	P26		200	14942
Burrup Peninsula rock pile communities	Priority 1		1	P27		200	14943
Burrup Peninsula rock pile communities	Priority 1		1	P28		200	14944
Burrup Peninsula rock pile communities	Priority 1		1	P36		200	14952
Burrup Peninsula rock pile communities	Priority 1		1	P37(second)		200	14954
Burrup Peninsula rock pile communities	Priority 1		1	P32		200	14948
Burrup Peninsula rock pile communities	Priority 1		1	P33		200	14949
Burrup Peninsula rock pile communities	Priority 1		1	P29		200	14945
Burrup Peninsula rock pile communities	Priority 1		1	P21		200	14938
Burrup Peninsula rock pile communities	Priority 1		1	P20		200	14937
Burrup Peninsula rock pile communities	Priority 1		1	P14		200	14932
Burrup Peninsula rock pile communities	Priority 1		1	P17		200	14935
Burrup Peninsula rock pile communities	Priority 1		1	P62		200	14980
Burrup Peninsula rock pile communities	Priority 1		1	P42		200	14959
Burrup Peninsula rock pile communities	Priority 1		1	P45		200	14962
Burrup Peninsula rock pile communities	Priority 1		1	P40		200	14957
Burrup Peninsula rock pile communities	Priority 1		1	BRPile2		500	0
Burrup Peninsula rock pile communities	Priority 1		1	BRPile3		500	0
Burrup Peninsula rock pool communities	Priority 1		1	BRPool1		500	0
Burrup Peninsula rock pool communities	Priority 1		1	BRPool2		500	0
Burrup Peninsula rock pool communities	Priority 1		1	BRPool3		500	0

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5	-20.5	1980
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5	-20.5	1983
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5	-20.5	1977
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5	-20.5	1981
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5872	-20.4689	1998
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.85	-20.45	2005
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.91	-20.41	0
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.8494	-20.4843	0
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.6283	-20.4564	0
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.6343	-20.5843	0
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5194	-20.6069	1983
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5194	-20.6069	1983
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5194	-20.6069	1984
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.6343	-20.5843	1984
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.8494	-20.4843	1990
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5194	-20.6069	1990
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.6343	-20.5843	1990
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.5872	-20.4689	1998
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.85	-20.45	2005
Actitis hypoleucos	Scolopacidae	Actitis	hypoleucos	common sandpiper	BIRD	IA	116.6283	-20.4564	0
Anous stolidus	Laridae	Anous	stolidus	common noddy	BIRD	IA	116.7833	-20.5833	1988
Anous stolidus	Laridae	Anous	stolidus	common noddy	BIRD	IA	116.6283	-20.4564	0
Anous stolidus	Laridae	Anous	stolidus	common noddy	BIRD	IA	116.5381	-20.4778	1983
Anous stolidus	Laridae	Anous	stolidus	common noddy	BIRD	IA	116.6254	-20.4528	1983
Anous stolidus	Laridae	Anous	stolidus	common noddy	BIRD	IA	116.6283	-20.4564	0
Apus pacificus	Apodidae	Apus	pacificus	fork-tailed swift	BIRD	IA	116.5194	-20.6069	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5	-20.5	1981
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5	-20.5	1977
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5	-20.5	1974
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5	-20.5	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5	-20.5	1966
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.58	-20.58	1979
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.58	-20.58	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5808	-20.4758	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5872	-20.4689	1998
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6583	-20.525	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.91	-20.41	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7768	-20.5405	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8494	-20.4843	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6592	-20.6094	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6225	-20.4697	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5381	-20.4778	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6283	-20.4564	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6396	-20.4392	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5936	-20.4817	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6343	-20.5843	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8064	-20.4931	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8056	-20.3858	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7768	-20.5405	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8494	-20.4843	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.4444	-20.6572	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6831	-20.6547	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6225	-20.4697	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5194	-20.6069	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8317	-20.3889	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5381	-20.4778	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8494	-20.4843	1982
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6283	-20.4564	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6283	-20.4564	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6283	-20.4564	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8494	-20.4843	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8494	-20.4843	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7768	-20.5405	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5194	-20.6069	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7768	-20.5405	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8317	-20.3889	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.4444	-20.6572	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6393	-20.4388	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5381	-20.4778	1983
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5194	-20.6069	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8056	-20.3858	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8064	-20.4931	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5936	-20.4817	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8317	-20.3889	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6393	-20.4388	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5936	-20.4817	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5381	-20.4778	1984
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5936	-20.4817	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6343	-20.5843	1990
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6583	-20.525	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5808	-20.4758	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5872	-20.4689	1998
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8494	-20.4843	1978
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6225	-20.4697	1981
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8064	-20.4931	2014
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7768	-20.5405	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6283	-20.4564	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8317	-20.3889	0
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8806	-20.3881	1998
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.8202	-20.5862	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.6583	-20.525	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5822	-20.4745	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5885	-20.4676	1998
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7597	-20.6403	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7047	-20.6662	2010
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7972	-20.6331	1999
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5013	-20.4987	1981
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.918	-20.4153	1980
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5847	-20.582	1980
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5847	-20.4153	1980
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5847	-20.4153	1981
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7513	-20.582	1981
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7513	-20.582	1981
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5847	-20.582	1981
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5847	-20.4153	1978
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5013	-20.4987	1977
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5847	-20.582	1979
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5847	-20.4153	1979
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.7513	-20.582	1979
Arenaria interpres	Scolopacidae	Arenaria	interpres	ruddy turnstone	BIRD	IA	116.5013	-20.4987	1980
Calidris acuminata	Scolopacidae	Calidris	acuminata	sharp-tailed sandpiper	BIRD	IA	116.5194	-20.6069	1984
Calidris acuminata	Scolopacidae	Calidris	acuminata	sharp-tailed sandpiper	BIRD	IA	116.4444	-20.6572	1990
Calidris acuminata	Scolopacidae	Calidris	acuminata	sharp-tailed sandpiper	BIRD	IA	116.5194	-20.6069	1990
Calidris acuminata	Scolopacidae	Calidris	acuminata	sharp-tailed sandpiper	BIRD	IA	116.7513	-20.582	1981
Calidris alba	Scolopacidae	Calidris	alba	sanderling	BIRD	IA	116.5	-20.5	1983
Calidris alba	Scolopacidae	Calidris	alba	sanderling	BIRD	IA	116.85	-20.45	2005
Calidris alba	Scolopacidae	Calidris	alba	sanderling	BIRD	IA	116.8513	-20.4487	2005
Calidris alba	Scolopacidae	Calidris	alba	sanderling	BIRD	IA	116.8806	-20.3881	1998
Calidris alba	Scolopacidae	Calidris	alba	sanderling	BIRD	IA	116.8513	-20.4487	2005
Calidris alba	Scolopacidae	Calidris	alba	sanderling	BIRD	IA	116.5013	-20.4987	1981
Calidris canutus	Scolopacidae	Calidris	canutus	red knot, knot	BIRD	IA (& VU	116.4444	-20.6572	1990
Calidris canutus	Scolopacidae	Calidris	canutus	red knot, knot	BIRD	IA (& VU	116.5	-20.5	1980
Calidris canutus	Scolopacidae	Calidris	canutus	red knot, knot	BIRD	IA (& VU	116.8494	-20.4843	1978
Calidris canutus	Scolopacidae	Calidris	canutus	red knot, knot	BIRD	IA (& VU	116.5013	-20.4987	1980
Calidris ferruginea	Scolopacidae	Calidris	ferruginea	curlew sandpiper	BIRD	VU & IA	116.8494	-20.4843	1990
Calidris ferruginea	Scolopacidae	Calidris	ferruginea	curlew sandpiper	BIRD	VU & IA	116.5194	-20.6069	1990
Calidris ferruginea	Scolopacidae	Calidris	ferruginea	curlew sandpiper	BIRD	VU & IA	116.5	-20.5	1977
Calidris ferruginea	Scolopacidae	Calidris	ferruginea	curlew sandpiper	BIRD	VU & IA	116.5	-20.5	1966
Calidris ferruginea	Scolopacidae	Calidris	ferruginea	curlew sandpiper	BIRD	VU & IA	116.5013	-20.4987	1977
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5936	-20.4817	1984
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.8494	-20.4843	1990

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5936	-20.4817	1990
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5	-20.5	1977
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5	-20.5	1983
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5	-20.5	1980
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5	-20.5	1981
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.85	-20.45	2005
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.8513	-20.4487	2005
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.8513	-20.4487	2005
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.7988	-20.6323	2010
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.7972	-20.6331	1999
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5013	-20.4987	1981
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5847	-20.4153	1978
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5013	-20.4987	1978
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5013	-20.4987	1977
Calidris ruficollis	Scolopacidae	Calidris	ruficollis	red-necked stint	BIRD	IA	116.5013	-20.4987	1980
Caretta caretta	Cheloniidae	Caretta	caretta	loggerhead turtle	REPTILE	EN	116.917	-20.3999	2008
Caretta caretta	Cheloniidae	Caretta	caretta	loggerhead turtle	REPTILE	EN	116.8317	-20.3889	1984
Caretta caretta	Cheloniidae	Caretta	caretta	loggerhead turtle	REPTILE	EN	116.917	-20.3999	2008
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.6283	-20.4564	0
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.8494	-20.4843	1990
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.5381	-20.4778	1990
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.675	-20.5178	1990
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.6283	-20.4564	1983
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.675	-20.5178	1983
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.5	-20.5	1983
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.5	-20.5	1966
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.8064	-20.4931	2014
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.6283	-20.4564	0
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.8202	-20.5862	1999
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.8183	-20.5817	1999
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.7597	-20.6403	1999
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.7819	-20.5903	1999
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.7988	-20.6323	2010
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.7047	-20.6662	2010
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.7972	-20.6331	1999
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.5013	-20.4987	1981
Charadrius leschenaultii	Charadriidae	Charadrius	leschenaultii	greater sand plover, large san	BIRD	IA (& VU	116.5847	-20.4153	1981
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.8494	-20.4843	1990
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.5194	-20.6069	1990
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.6283	-20.4564	1990
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.5936	-20.4817	1990
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.5936	-20.4817	1982
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.6283	-20.4564	1983
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.5194	-20.6069	1984
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.85	-20.45	2005
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.85	-20.45	2005
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.8494	-20.4843	1978
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.8806	-20.3881	1998
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.8513	-20.4487	2005
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.7988	-20.6323	2010
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.7513	-20.582	1977
Charadrius mongolus	Charadriidae	Charadrius	mongolus	lesser sand plover	BIRD	EN & IA	116.5847	-20.4153	1977
Charadrius veredus	Charadriidae	Charadrius	veredus	oriental plover	BIRD	IA	116.5194	-20.6069	1990
Charadrius veredus	Charadriidae	Charadrius	veredus	oriental plover	BIRD	IA	116.6283	-20.4564	1990
Charadrius veredus	Charadriidae	Charadrius	veredus	oriental plover	BIRD	IA	116.5194	-20.6069	1984
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.6623	-20.5327	2015
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5194	-20.6069	0
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5389	-20.5356	0
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.675	-20.5178	0
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5936	-20.4817	0
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5194	-20.6069	0
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5936	-20.4817	2012
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5389	-20.5356	1992
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.8064	-20.4931	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.8056	-20.3858	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.8494	-20.4843	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.4444	-20.6572	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5194	-20.6069	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5389	-20.5356	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.8317	-20.3889	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.6283	-20.4564	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.8806	-20.3881	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.675	-20.5178	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.5936	-20.4817	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.6343	-20.5843	1990
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Chelonia mydas	Cheloniidae	Chelonia	mydas	green turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.85	-20.4833	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.85	-20.4833	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1900
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.748	-20.6227	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4842	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5115	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4854	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8332	-20.4876	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8344	-20.4842	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8345	-20.4839	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8347	-20.4837	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8332	-20.4876	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8345	-20.4839	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8332	-20.4876	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4833	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8351	-20.4831	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8346	-20.4861	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8337	-20.4833	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4843	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8296	-20.4902	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.834	-20.4865	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8343	-20.4864	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8357	-20.4846	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8358	-20.4844	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8359	-20.4842	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8364	-20.4838	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8365	-20.4836	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8361	-20.484	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8357	-20.4846	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8334	-20.4839	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8361	-20.484	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4867	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8308	-20.4889	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8335	-20.4836	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8807	-20.4282	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8803	-20.4284	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8803	-20.4284	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8812	-20.4275	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8824	-20.4267	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8828	-20.4256	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8763	-20.4345	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8798	-20.4334	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8827	-20.4264	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8791	-20.4337	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.882	-20.427	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4816	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8337	-20.4833	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4843	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4867	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8365	-20.4836	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8331	-20.4849	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8824	-20.4267	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8798	-20.4334	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8828	-20.4256	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8763	-20.4345	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8827	-20.4264	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.881	-20.4279	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8332	-20.4821	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8296	-20.4902	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8346	-20.4861	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8359	-20.4842	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.881	-20.4279	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8812	-20.4275	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.882	-20.427	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8786	-20.4337	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8828	-20.426	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4843	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8302	-20.4896	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8332	-20.4879	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8332	-20.4876	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4874	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8315	-20.4882	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8769	-20.4343	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8763	-20.4345	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8844	-20.4825	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8825	-20.4825	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8775	-20.4339	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8812	-20.4275	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8004	-20.5705	1990
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.7723	-20.6376	1990
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.809	-20.5724	1990
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.7884	-20.638	1990
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8324	-20.4874	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8235	-20.5176	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8235	-20.5176	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8247	-20.5164	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8314	-20.4885	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8328	-20.4852	2015

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.833	-20.4822	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8331	-20.4822	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8335	-20.4825	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8335	-20.4844	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8344	-20.4865	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4837	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4852	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8353	-20.4833	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8247	-20.5164	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4855	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8295	-20.4903	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8299	-20.49	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8307	-20.4891	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4883	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8351	-20.4848	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8702	-20.4373	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8726	-20.4366	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8697	-20.4392	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8727	-20.4374	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8702	-20.4373	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8699	-20.4383	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8726	-20.4366	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8734	-20.4351	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8295	-20.4903	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4818	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4843	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4837	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8351	-20.4848	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8699	-20.4383	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.872	-20.4372	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8734	-20.4351	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8317	-20.4881	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4818	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8339	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.834	-20.4869	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8242	-20.5171	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8712	-20.4375	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8702	-20.4373	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8699	-20.4383	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8727	-20.4365	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4816	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8306	-20.4894	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8337	-20.4872	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4856	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4847	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4837	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8359	-20.4822	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8335	-20.484	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.486	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8337	-20.4872	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8348	-20.484	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8351	-20.4832	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8357	-20.4825	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4884	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8359	-20.4822	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8346	-20.486	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4875	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8302	-20.4896	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8326	-20.487	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8328	-20.4852	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8316	-20.4883	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4884	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8348	-20.484	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8362	-20.4819	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8361	-20.482	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4816	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8354	-20.483	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4816	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.486	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8297	-20.4902	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8328	-20.4886	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8301	-20.4897	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8376	-20.4801	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8304	-20.4895	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8	-20.5	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.9	-20.5	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.85	-20.4833	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.85	-20.4833	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1900
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.5	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1970
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.85	-20.4833	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.85	-20.4833	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1986
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4833	1980
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	1978
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	1970
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5119	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8217	-20.5118	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8522	-20.4495	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8525	-20.4493	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8522	-20.4495	2012

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8525	-20.4493	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8217	-20.5118	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8212	-20.5119	2012
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.835	-20.4855	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8307	-20.4891	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8339	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8333	-20.4818	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8727	-20.4365	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8295	-20.4903	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8336	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8347	-20.4846	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8349	-20.4857	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8351	-20.4848	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4883	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.833	-20.4822	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8324	-20.4874	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8335	-20.4844	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8328	-20.4852	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8196	-20.5163	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8326	-20.487	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8328	-20.4852	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8316	-20.4883	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4884	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8316	-20.4883	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8348	-20.484	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8362	-20.4819	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8361	-20.482	2015
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8207	-20.5126	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.845	-20.5151	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8421	-20.4755	2013
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8346	-20.4861	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8361	-20.484	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8357	-20.4846	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8334	-20.4839	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8361	-20.484	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8329	-20.4867	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8308	-20.4889	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8335	-20.4836	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8815	-20.4271	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8807	-20.4282	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8803	-20.4284	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8331	-20.4849	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8359	-20.4842	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8315	-20.4882	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8844	-20.4825	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8825	-20.4825	2014
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8494	-20.4843	2016
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8503	-20.4987	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.7713	-20.6087	0
Dasyurus hallucatus	Dasyuridae	Dasyurus	hallucatus	northern quoll	MAMMAL	EN	116.8508	-20.4987	0
Dugong dugon	Dugongidae	Dugong	dugon	dugong	MAMMAL	OS	116.8333	-20.3833	0
Dugong dugon	Dugongidae	Dugong	dugon	dugong	MAMMAL	OS	116.7568	-20.6047	2006
Dugong dugon	Dugongidae	Dugong	dugon	dugong	MAMMAL	OS	116.6111	-20.4762	2012
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5194	-20.6069	1978
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5389	-20.5356	0
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.675	-20.5178	0
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5936	-20.4817	0
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5936	-20.4817	2012
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5389	-20.5356	1992
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.8064	-20.4931	1990

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.8494	-20.4843	1990
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.4444	-20.6572	1990
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.6225	-20.4697	1990
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5194	-20.6069	1990
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5389	-20.5356	1990
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.675	-20.5178	1990
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.5936	-20.4817	1990
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.917	-20.3999	2009

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Eretmochelys imbricata	Cheloniidae	Eretmochelys	imbricata	hawksbill turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5847	-20.4153	1980
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.7513	-20.582	1980
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.7513	-20.582	1981
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5847	-20.4153	1981
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.7513	-20.582	1981
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5847	-20.4153	1978
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5847	-20.4153	1977
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5847	-20.582	1977
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5847	-20.582	1979
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5847	-20.582	1979
Fregata ariel	Fregatidae	Fregata	ariel	lesser frigatebird	BIRD	IA	116.5013	-20.4987	1980
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.8056	-20.3858	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.5936	-20.4817	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.8069	-20.3845	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.5949	-20.4803	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.8597	-20.4044	1984
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.8597	-20.4044	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.5936	-20.4817	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.8597	-20.4044	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.8073	-20.3847	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.7713	-20.6087	1997
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.5953	-20.4807	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.8069	-20.3845	0
Hydromys chrysogaster	Muridae	Hydromys	chrysogaster	water-rat, rakali	MAMMAL	P4	116.5949	-20.4803	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8314	-20.3889	1987
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8314	-20.3889	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8314	-20.3889	1991
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6292	-20.4571	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6939	-20.5202	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5946	-20.4797	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5204	-20.6007	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4449	-20.6588	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5204	-20.6007	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5204	-20.6007	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4449	-20.6588	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8044	-20.3856	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.777	-20.5399	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.777	-20.5399	1982
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5	-20.5	1974
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5	-20.5	1978
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5	-20.5	1981
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5747	-20.5931	2008
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.58	-20.58	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5872	-20.4689	1998
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.63	-20.58	1901
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6583	-20.525	1999
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6667	-20.5194	2000
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6675	-20.5203	2002
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.85	-20.45	2005
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8519	-20.4492	2002
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8875	-20.3917	2000
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.91	-20.41	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8056	-20.3858	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6943	-20.5202	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5936	-20.4817	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1987
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8064	-20.4931	2000
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	1982
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1991
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6169	-20.4441	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8056	-20.3858	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	1982
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8494	-20.4843	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5381	-20.4778	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.675	-20.5178	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6943	-20.5202	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6737	-20.4485	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6732	-20.4512	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5079	-20.4995	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5936	-20.4817	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6149	-20.5694	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6343	-20.5843	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6169	-20.4441	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8494	-20.4843	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5389	-20.5356	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	1982
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5381	-20.4778	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.675	-20.5178	1982
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7754	-20.5404	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.584	-20.5753	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.654	-20.5059	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.675	-20.5178	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8332	-20.3806	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4513	-20.6649	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5079	-20.4995	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4487	-20.6526	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5936	-20.4817	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8336	-20.3834	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6737	-20.4485	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6343	-20.5843	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6149	-20.5694	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8336	-20.3834	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8056	-20.3858	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6737	-20.4485	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6169	-20.4441	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5381	-20.4778	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5079	-20.4995	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6343	-20.5843	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4449	-20.6588	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5204	-20.6007	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6939	-20.5202	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6292	-20.4571	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.654	-20.5059	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8056	-20.3858	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	1983

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8494	-20.4843	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5389	-20.5356	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6737	-20.4485	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5946	-20.4797	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8494	-20.4843	1978
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8064	-20.4931	2014
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8064	-20.4931	2000
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8056	-20.3858	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1971
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1991
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1987
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6943	-20.5202	1971
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5936	-20.4817	1983
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8597	-20.4044	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4313	-20.6537	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5936	-20.4817	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6149	-20.5694	1990
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6943	-20.5202	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.654	-20.5059	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	1984
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8806	-20.3881	2000
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8168	-20.5091	2015
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	1918
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	1918
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8056	-20.3858	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.7768	-20.5405	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.4444	-20.6572	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5194	-20.6069	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.8317	-20.3889	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6283	-20.4564	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.6943	-20.5202	0
Hydroprogne caspia	Laridae	Hydroprogne	caspia	Caspian tern	BIRD	IA	116.5936	-20.4817	0
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.8486	-20.4884	1993
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.752	-20.633	2004
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7073	-20.6668	2005
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.767	-20.6571	2001
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.782	-20.593	2014
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.777	-20.599	2015
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.777	-20.598	2015
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.782	-20.592	2015
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7685	-20.624	2015
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7712	-20.6065	2016
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7785	-20.5949	2015
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7785	-20.5949	2015
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.777	-20.599	2016
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.771	-20.589	2016
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7675	-20.6131	2016
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.779	-20.595	2017
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.768	-20.613	2017
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7619	-20.6086	2018
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.7727	-20.6113	2018
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.8494	-20.4843	1990
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.6343	-20.5843	1990
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.8486	-20.4884	1993
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.8494	-20.4843	0
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.8119	-20.5735	0
Liasis olivaceus barroni	Boidae	Liasis	olivaceus	Pilbara olive python	REPTILE	VU	116.8494	-20.4843	0
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.85	-20.45	2005
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8494	-20.4843	0
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.4444	-20.6572	1983
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8494	-20.4843	1984
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8064	-20.4931	1990
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8494	-20.4843	1990
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.4444	-20.6572	1990
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.85	-20.45	2005
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8494	-20.4843	1978
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.7588	-20.6062	1998
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8105	-20.6059	1999
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8105	-20.6059	1999
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.7597	-20.6403	1999
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.8513	-20.4487	2005
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.7988	-20.6323	2010
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.7047	-20.6662	2010
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.7972	-20.6331	1999
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.5013	-20.4987	1981
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.918	-20.4153	1980
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.7513	-20.582	1977
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.5013	-20.4987	1978
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.5013	-20.4987	1978
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.5013	-20.4987	1977
Limosa lapponica	Scolopacidae	Limosa	lapponica	bar-tailed godwit	BIRD	IA (& VU	116.5013	-20.4987	1980
Limosa limosa	Scolopacidae	Limosa	limosa	black-tailed godwit	BIRD	IA	116.5013	-20.4987	1981
Macroderma gigas	Megadermatidae	Macroderma	gigas	ghost bat	MAMMAL	VU	116.8022	-20.5909	2006
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.8013	-20.5653	1999
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.9267	-20.3733	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.9267	-20.3733	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.9267	-20.3733	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.9267	-20.3733	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.9133	-20.3725	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.865	-20.3433	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.865	-20.3433	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.865	-20.3433	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.75	-20.35	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.75	-20.35	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.7367	-20.4533	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.7333	-20.3667	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.6467	-20.3967	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.69	-20.37	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.69	-20.37	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.69	-20.37	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.69	-20.37	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.61	-20.41	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.61	-20.41	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.61	-20.41	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.61	-20.41	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.52	-20.47	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.52	-20.47	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.52	-20.47	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.5	-20.48	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.46	-20.52	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.46	-20.52	2014
Megaptera novaeangliae	Balaenopteridae	Megaptera	novaeangliae	humpback whale	MAMMAL	CD	116.46	-20.52	2014
Mormopterus (Ozimops) cot	Molossidae	Mormopterus	(Ozimops) cobourgianu	north-western free-tailed bat	MAMMAL	P1	116.8022	-20.5909	2006
Mormopterus (Ozimops) cot	Molossidae	Mormopterus	(Ozimops) cobourgianu	north-western free-tailed bat	MAMMAL	P1	116.8057	-20.6068	2001
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8333	-20.6167	0

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.5194	-20.6069	1978
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.5936	-20.4817	2012
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.5194	-20.6069	1990
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8317	-20.3889	1990
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8806	-20.3881	1990
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2009

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2009

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.5389	-20.5356	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.6461	-20.6533	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.6283	-20.4564	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8119	-20.5735	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8317	-20.3889	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8222	-20.4231	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8181	-20.4136	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.7768	-20.5405	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8064	-20.4931	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8211	-20.4486	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.4444	-20.6572	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.8806	-20.3881	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.5194	-20.6069	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.5936	-20.4817	0
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2008

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2008
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2008
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2008
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2009

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Natator depressus	Cheloniidae	Natator	depressus	flatback turtle	REPTILE	VU	116.917	-20.3999	2009

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8806	-20.3881	1990
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.6737	-20.4485	1990
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.6343	-20.5843	1990
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8513	-20.4487	2005
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8494	-20.4843	1978
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8806	-20.3881	1998
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8265	-20.4836	2015
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8215	-20.5195	2015
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8014	-20.5711	2001
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8105	-20.6059	1999
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7822	-20.6595	2004
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7597	-20.6403	1999
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7819	-20.5903	1999
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.8513	-20.4487	2005
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7988	-20.6323	2010
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7972	-20.6331	1999
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.5013	-20.4987	1981
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7513	-20.582	1980
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7513	-20.582	1981
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7513	-20.582	1981
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.5013	-20.4987	1978
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.5013	-20.4987	1977
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.7513	-20.582	1978
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.5013	-20.4987	1977
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.5013	-20.4987	1979
Numenius phaeopus	Scolopacidae	Numenius	phaeopus	whimbrel	BIRD	IA	116.5013	-20.4987	1980
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.5	-20.5	1974
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.91	-20.41	0
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.8494	-20.4843	0
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.4444	-20.6572	0
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.6343	-20.5843	1983
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.6404	-20.4913	1983
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.4444	-20.6572	1984
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.8064	-20.4931	1984
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.7408	-20.4168	1984
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.5528	-20.4818	1984
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.8494	-20.4843	0
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.7322	-20.5958	2008
Oceanites oceanicus	Hydrobatidae	Oceanites	oceanicus	Wilson's storm-petrel	BIRD	IA	116.918	-20.4153	1979
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.5	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.5	1981
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.5	1974
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.5	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.5	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.5	1981
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.5	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5747	-20.5931	2008
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.58	-20.58	1978
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.58	-20.58	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.58	-20.58	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5808	-20.4758	1999
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5825	-20.585	2008
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5872	-20.4689	1998
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.61	-20.58	1901
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.63	-20.58	1901
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.63	-20.58	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6583	-20.525	1999
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6667	-20.5194	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6675	-20.5203	2002
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.85	-20.45	2005
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8519	-20.4492	2002
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8875	-20.3917	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.91	-20.41	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.45	-20.666	1918
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5	-20.6	1918
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.616	-20.583	1901
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.866	-20.383	1918
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.866	-20.383	1918
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1987
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5479	-20.5379	1978
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1987
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6254	-20.4528	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1978
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5946	-20.4797	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1978
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1976
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1978
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6169	-20.4441	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6592	-20.6094	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4313	-20.6537	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6225	-20.4697	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8211	-20.4486	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5389	-20.5356	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6796	-20.5419	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5381	-20.4778	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6396	-20.4392	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6737	-20.4485	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6732	-20.4512	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5079	-20.4995	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6149	-20.5694	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8211	-20.4486	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5389	-20.5356	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6787	-20.5216	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5327	-20.5428	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5389	-20.5356	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6254	-20.4528	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6225	-20.4697	1983

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.653	-20.5039	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6796	-20.5419	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8321	-20.3883	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8024	-20.385	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6269	-20.4543	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6254	-20.4528	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5793	-20.5805	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6538	-20.5043	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8321	-20.3883	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4498	-20.6647	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5816	-20.579	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8024	-20.385	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4313	-20.6537	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5079	-20.4995	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5816	-20.579	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6786	-20.5218	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6149	-20.5694	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8056	-20.3858	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6737	-20.4485	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6254	-20.4528	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6169	-20.4441	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5381	-20.4778	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5389	-20.5356	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6149	-20.5694	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8505	-20.4796	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5204	-20.6007	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6742	-20.5151	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8049	-20.4927	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6342	-20.5841	1976
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4449	-20.6588	1987
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.777	-20.5399	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6253	-20.4526	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6292	-20.4571	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8314	-20.3889	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.654	-20.5059	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8056	-20.3858	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6796	-20.5419	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.88	-20.3861	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6943	-20.5202	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5473	-20.5379	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6737	-20.4485	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6225	-20.4697	1981
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	1970
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	1970
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1970
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1978
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1970
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1970
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1970
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	1980
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1987
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5479	-20.5379	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6254	-20.4528	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1982
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1976
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1983
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1976
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1977
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6169	-20.4441	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8597	-20.4044	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6831	-20.6547	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6225	-20.4697	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4313	-20.6537	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8211	-20.4486	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5389	-20.5356	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6796	-20.5419	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5381	-20.4778	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6943	-20.5202	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6393	-20.4388	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6393	-20.4388	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6149	-20.5694	1990

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	1990
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6254	-20.4528	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.654	-20.5059	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6796	-20.5419	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	1978
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5389	-20.5356	1984
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	2000
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	2004
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8169	-20.5092	2015
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8273	-20.5152	2015
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8347	-20.4846	2015
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8222	-20.4231	2015
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8181	-20.4136	2015
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	1918
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	1918
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8064	-20.4931	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.7768	-20.5405	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8494	-20.4843	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.4444	-20.6572	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5479	-20.5379	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5194	-20.6069	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8317	-20.3889	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6254	-20.4528	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6283	-20.4564	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.8806	-20.3881	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.675	-20.5178	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.5936	-20.4817	0
Pandion cristatus	Accipitridae	Pandion	cristatus	osprey, eastern osprey	BIRD	IA	116.6343	-20.5843	0
Pluvialis fulva	Charadriidae	Pluvialis	fulva	Pacific golden plover	BIRD	IA	116.5	-20.5	1980
Pluvialis fulva	Charadriidae	Pluvialis	fulva	Pacific golden plover	BIRD	IA	116.6283	-20.4564	1983
Pluvialis fulva	Charadriidae	Pluvialis	fulva	Pacific golden plover	BIRD	IA	116.7047	-20.6662	2010
Pluvialis fulva	Charadriidae	Pluvialis	fulva	Pacific golden plover	BIRD	IA	116.5013	-20.4987	1980
Pluvialis squatarola	Charadriidae	Pluvialis	squatarola	grey plover	BIRD	IA	116.5	-20.5	1983
Pluvialis squatarola	Charadriidae	Pluvialis	squatarola	grey plover	BIRD	IA	116.8494	-20.4843	1990
Pluvialis squatarola	Charadriidae	Pluvialis	squatarola	grey plover	BIRD	IA	116.4444	-20.6572	1990
Pluvialis squatarola	Charadriidae	Pluvialis	squatarola	grey plover	BIRD	IA	116.4485	-20.6657	1983
Pluvialis squatarola	Charadriidae	Pluvialis	squatarola	grey plover	BIRD	IA	116.7988	-20.6323	2010
Pluvialis squatarola	Charadriidae	Pluvialis	squatarola	grey plover	BIRD	IA	116.5013	-20.4987	1981
Pseudomys chapmani	Muridae	Pseudomys	chapmani	western pebble-mound mous	MAMMAL	P4	116.8313	-20.5787	1983
Pseudomys chapmani	Muridae	Pseudomys	chapmani	western pebble-mound mous	MAMMAL	P4	116.7713	-20.6087	1994
Stenella longirostris	Delphinidae	Stenella	longirostris	spinner dolphin	MAMMAL	P4	116.6633	-20.5342	2014
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.538	-20.5352	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6737	-20.4482	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5	-20.5	1974
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5	-20.5	1983
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.58	-20.58	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.91	-20.41	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6732	-20.4512	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5389	-20.5356	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8597	-20.4044	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8494	-20.4843	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6943	-20.5202	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6396	-20.4392	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6737	-20.4485	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6732	-20.4512	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5079	-20.4995	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5936	-20.4817	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6343	-20.5843	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8056	-20.3858	1990
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5381	-20.4778	1983
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5079	-20.4995	1984
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5079	-20.4995	1984
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8056	-20.3858	1984
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6737	-20.4485	1984
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6393	-20.4388	1984
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5936	-20.4817	1984
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8317	-20.3889	1990
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5381	-20.4778	1990
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6393	-20.4388	1990
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6737	-20.4485	1990
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5079	-20.4995	1990
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5936	-20.4817	1990
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6943	-20.5202	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6343	-20.5843	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5936	-20.4817	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8494	-20.4843	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8388	-20.416	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.538	-20.5352	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6737	-20.4482	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5389	-20.5356	1994
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6732	-20.4512	1994
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.8806	-20.3881	1998
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5389	-20.5356	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.6732	-20.4512	0
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5013	-20.4987	1981
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5847	-20.582	1981
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.7513	-20.582	1981
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.7513	-20.4153	1981
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.7513	-20.582	1979
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5847	-20.4153	1979
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.5847	-20.582	1979
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.7513	-20.582	1979
Sterna dougallii	Laridae	Sterna	dougallii	roseate tern	BIRD	IA	116.918	-20.4153	1979
Sterna hirundo	Laridae	Sterna	hirundo	Common Tern	BIRD	IA	116.4444	-20.6572	1990
Sterna hirundo	Laridae	Sterna	hirundo	Common Tern	BIRD	IA	116.5194	-20.6069	1990
Sterna hirundo	Laridae	Sterna	hirundo	Common Tern	BIRD	IA	116.5389	-20.5356	1990
Sterna hirundo	Laridae	Sterna	hirundo	Common Tern	BIRD	IA	116.8317	-20.3889	1990
Sterna hirundo	Laridae	Sterna	hirundo	Common Tern	BIRD	IA	116.6343	-20.5843	1990
Sterna hirundo	Laridae	Sterna	hirundo	Common Tern	BIRD	IA	116.4456	-20.6489	2000
Sterna hirundo	Laridae	Sterna	hirundo	common tern	BIRD	IA	116.5758	-20.6397	2000
Sterna hirundo	Laridae	Sterna	hirundo	common tern	BIRD	IA	116.4814	-20.6461	2000
Sterna hirundo	Laridae	Sterna	hirundo	common tern	BIRD	IA	116.4456	-20.6489	2000
Sternula albifrons	Laridae	Sternula	albifrons	little tern	BIRD	IA	116.58	-20.58	2010
Sternula albifrons	Laridae	Sternula	albifrons	little tern	BIRD	IA	116.8064	-20.4931	2014
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.432	-20.6537	1991
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8044	-20.3856	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8044	-20.3856	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.866	-20.383	1918
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5	-20.5	1974
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8056	-20.3858	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.4313	-20.6537	1991
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8056	-20.3858	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8317	-20.3889	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5381	-20.4778	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.675	-20.5178	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6737	-20.4485	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6732	-20.4512	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5079	-20.4995	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5936	-20.4817	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6149	-20.5694	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5936	-20.4817	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6283	-20.4564	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.654	-20.5059	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8056	-20.3858	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8056	-20.3858	1983

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CO	GDA_LONG	GDA_LAT	YEAR
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.4444	-20.6572	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5381	-20.4778	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5929	-20.5894	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5389	-20.5356	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5079	-20.4995	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5671	-20.4849	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5671	-20.4849	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6149	-20.5694	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5936	-20.4817	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5936	-20.4817	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6737	-20.4485	1979
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6149	-20.5694	1984
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8064	-20.4931	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8597	-20.4044	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8494	-20.4843	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.4444	-20.6572	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5194	-20.6069	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5389	-20.5356	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5381	-20.4778	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6283	-20.4564	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.675	-20.5178	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5079	-20.4995	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6343	-20.5843	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.432	-20.6537	1991
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.654	-20.5059	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8317	-20.3889	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8056	-20.3858	1983
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6737	-20.4485	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8597	-20.4044	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.4313	-20.6537	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5936	-20.4817	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.6149	-20.5694	1990
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.654	-20.5059	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8317	-20.3889	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.5936	-20.4817	2004
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.4444	-20.6572	1918
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.8056	-20.3858	0
Sternula nereis nereis	Laridae	Sternula	nereis	fairy tern	BIRD	VU	116.4313	-20.6537	0
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.8056	-20.3858	0
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6737	-20.4485	1979
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6732	-20.4512	1979
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.7273	-20.533	1983
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6861	-20.5284	1983
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6641	-20.5354	1983
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6799	-20.617	1983
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6737	-20.4485	1979
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6737	-20.4485	1979
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6737	-20.4485	1980
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.8075	-20.3877	1984
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.7454	-20.4188	1984
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.6737	-20.4485	0
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.7513	-20.4153	1980
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.7513	-20.582	1980
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.7513	-20.582	1980
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.7513	-20.4153	1981
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.5847	-20.4153	1978
Sula leucogaster	Sulidae	Sula	leucogaster	brown booby	BIRD	IA	116.5847	-20.4153	1979
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5758	-20.6397	2000
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.8202	-20.5862	1999
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.8124	-20.5903	1999
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5822	-20.4745	1999
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.6675	-20.5203	2002
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.6675	-20.5203	2002
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.8347	-20.6653	2002
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7922	-20.5826	1999
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.8105	-20.6059	1999
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.8105	-20.6059	1999
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.8513	-20.4487	2005
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5847	-20.5833	2010
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7047	-20.6662	2010
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.6283	-20.4603	2011
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7983	-20.6339	2011
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7972	-20.6331	1999
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5013	-20.4987	1981
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.918	-20.4153	1980
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.8347	-20.4153	1980
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7513	-20.582	1980
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5847	-20.582	1981
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7513	-20.582	1981
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7513	-20.4153	1981
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5847	-20.4153	1981
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7513	-20.582	1981
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.7513	-20.582	1981
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5847	-20.4153	1979
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5847	-20.582	1979
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5847	-20.4153	1979
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5847	-20.582	1979
Thalasseus bergii	Laridae	Thalasseus	bergii	crested tern	BIRD	IA	116.5013	-20.4987	1980
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5	-20.5	1977
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5	-20.5	1966
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5	-20.5	1974
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5	-20.5	1983
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.58	-20.58	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6583	-20.525	1999
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6667	-20.5194	2000
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8056	-20.3858	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6592	-20.6094	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6283	-20.4564	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.675	-20.5178	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6343	-20.5843	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.7768	-20.5405	1983
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5194	-20.6069	1983
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5417	-20.5368	1983
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.654	-20.5059	1983
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8494	-20.4843	1983
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5194	-20.6069	1983
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5194	-20.6069	1984
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5194	-20.6069	1984
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8056	-20.3858	1984
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8056	-20.3858	1990
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.7768	-20.5405	1990
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8494	-20.4843	1990
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5194	-20.6069	1990
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.5389	-20.5356	1990
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8806	-20.3881	1990
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.675	-20.5178	1990
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6583	-20.525	1999
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6667	-20.5194	2000
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8494	-20.4843	1978
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8064	-20.4931	2014
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.654	-20.5059	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.6283	-20.4564	0
Tringa brevipes	Scolopacidae	Tringa	brevipes	grey-tailed tattler	BIRD	IA & P4	116.8806	-20.3881	1998
Tringa glareola	Scolopacidae	Tringa	glareola	wood sandpiper	BIRD	IA	116.5	-20.5	1977
Tringa glareola	Scolopacidae	Tringa	glareola	wood sandpiper	BIRD	IA	116.5	-20.5	1977
Tringa glareola	Scolopacidae	Tringa	glareola	wood sandpiper	BIRD	IA	116.5013	-20.4987	1977
Tringa glareola	Scolopacidae	Tringa	glareola	wood sandpiper	BIRD	IA	116.5013	-20.4987	1977
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1980
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1966
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1978
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1977

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1980
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1981
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1983
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5	-20.5	1977
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.58	-20.58	0
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.85	-20.45	2005
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.6225	-20.4697	0
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5194	-20.6069	1983
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5194	-20.6069	1990
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5936	-20.4817	1990
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.6343	-20.5843	1990
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.8494	-20.4843	1978
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.6225	-20.4697	1981
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.8806	-20.3881	1998
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.8347	-20.6653	2002
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7597	-20.6403	1999
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7819	-20.5903	1999
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.8513	-20.4487	2005
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7047	-20.6662	2010
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5013	-20.4987	1981
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5847	-20.582	1980
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5847	-20.4153	1980
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7513	-20.582	1980
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7513	-20.4153	1980
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5847	-20.4153	1981
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7513	-20.582	1981
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7513	-20.582	1981
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5847	-20.582	1981
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5013	-20.4987	1978
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5013	-20.4987	1977
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5013	-20.4987	1978
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7513	-20.582	1979
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5013	-20.4987	1977
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5013	-20.4987	1979
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.7513	-20.582	1979
Tringa nebularia	Scolopacidae	Tringa	nebularia	common greenshank, greensh	BIRD	IA	116.5013	-20.4987	1980
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis	marsh sandpiper, little greens	BIRD	IA	116.5	-20.5	1980
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis	marsh sandpiper, little greens	BIRD	IA	116.5	-20.5	1977
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis	marsh sandpiper, little greens	BIRD	IA	116.5	-20.5	1980
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis	marsh sandpiper, little greens	BIRD	IA	116.5	-20.5	1966
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis	marsh sandpiper, little greens	BIRD	IA	116.5013	-20.4987	1980
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis	marsh sandpiper, little greens	BIRD	IA	116.5013	-20.4987	1977
Tringa stagnatilis	Scolopacidae	Tringa	stagnatilis	marsh sandpiper, little greens	BIRD	IA	116.5013	-20.4987	1979
Xenus cinereus	Scolopacidae	Xenus	cinereus	Terek sandpiper	BIRD	IA	116.5	-20.5	1977
Xenus cinereus	Scolopacidae	Xenus	cinereus	Terek sandpiper	BIRD	IA	116.5	-20.5	1981
Xenus cinereus	Scolopacidae	Xenus	cinereus	Terek sandpiper	BIRD	IA	116.8268	-20.4836	2015
Xenus cinereus	Scolopacidae	Xenus	cinereus	Terek sandpiper	BIRD	IA	116.8215	-20.5195	2015
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.5381	-20.4778	1983
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.4593	-20.631	1983
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.4814	-20.6461	2000
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.5013	-20.4987	1978
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.5013	-20.4987	1977
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.7513	-20.582	1978
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.7513	-20.582	1979
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.5013	-20.4987	1977
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.7513	-20.582	1979
Chlidonias leucopterus	Laridae	Chlidonias	leucopterus	white-winged black tern, whit	BIRD	IA	116.5013	-20.4987	1980
Gelochelidon nilotica	Laridae	Gelochelidon	nilotica	gull-billed tern	BIRD	IA	116.8494	-20.4843	1990
Gelochelidon nilotica	Laridae	Gelochelidon	nilotica	gull-billed tern	BIRD	IA	116.5194	-20.6069	1990
Gelochelidon nilotica	Laridae	Gelochelidon	nilotica	gull-billed tern	BIRD	IA	116.5	-20.5	1980
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6247	-20.6665	1988
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5381	-20.4778	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6732	-20.4512	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5936	-20.4817	1981
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6169	-20.4441	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1982
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1992
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6247	-20.6665	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5381	-20.4778	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6732	-20.4512	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1981
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6396	-20.4392	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6737	-20.4485	1980
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6732	-20.4512	1980
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5079	-20.4995	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1982
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5381	-20.4778	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.8056	-20.3858	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1984
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5079	-20.4995	1984
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6737	-20.4485	1980
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6743	-20.4475	1984
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6393	-20.4388	1984
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.8056	-20.3858	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.8597	-20.4044	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.8317	-20.3889	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6393	-20.4388	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6737	-20.4485	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5079	-20.4995	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6737	-20.4485	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1981
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1994
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1984
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1994
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6247	-20.6665	1994
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6247	-20.6665	1988
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5381	-20.4778	1984
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6732	-20.4512	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6732	-20.4512	1983
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5936	-20.4817	1977
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6247	-20.6665	1991
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1988
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5381	-20.4778	1990
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	1984
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.8806	-20.3881	1998
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6169	-20.4441	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6225	-20.4697	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5389	-20.5356	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6247	-20.6665	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5381	-20.4778	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6283	-20.4564	0
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.6732	-20.4512	0

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5936	-20.4817	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5379	-20.4785	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5379	-20.4785	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6292	-20.4571	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6292	-20.4571	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8044	-20.3856	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6168	-20.4438	1991
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5327	-20.5428	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5473	-20.5379	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5379	-20.4785	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4449	-20.6588	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.777	-20.5399	0

NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_C(	GDA_LONG	GDA_LAT	YEAR
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.777	-20.5399	1982
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.506	-20.5002	1974
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6667	-20.5194	2000
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.86	-20.38	1962
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6169	-20.4441	1991
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4444	-20.6572	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5479	-20.5379	1978
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1988
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8056	-20.3858	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	1982
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1991
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5327	-20.5428	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4444	-20.6572	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6796	-20.5419	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5079	-20.4995	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5327	-20.5428	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.654	-20.5059	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5079	-20.4995	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8056	-20.3858	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4449	-20.6588	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.777	-20.5399	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5379	-20.4785	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6292	-20.4571	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6168	-20.4438	1991
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5327	-20.5428	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6169	-20.4441	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.654	-20.5059	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5473	-20.5379	1977
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6169	-20.4441	1991
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4444	-20.6572	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5479	-20.5379	1978
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1994
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1994
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1982
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1992
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1978
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8056	-20.3858	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8806	-20.3881	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5079	-20.4995	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.654	-20.5059	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6796	-20.5419	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4444	-20.6572	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	1984
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8806	-20.3881	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6169	-20.4441	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8056	-20.3858	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.7768	-20.5405	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4444	-20.6572	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5479	-20.5379	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6225	-20.4697	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5327	-20.5428	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5389	-20.5356	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5381	-20.4778	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6283	-20.4564	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.675	-20.5178	0

APPENDIX E: ATLAS OF LIVING AUSTRALIA 10 KM BUFFER DATABASE SEARCH RESULTS

- Appendix_X_Atlas of Living Australia Database Search (10km Search)

Species	Naturalised	Conservation Code	Endemic To Query Area
Amphibian			
Cyclorana maini			
Litoria rubella			
Bird			
Acrocephalus australis			
Acrocephalus australis			
Actitis hypoleucos			
Aegotheles cristatus			
Anhinga novaehollandiae			
Anous stolidus			
Anthus novaeseelandiae			
Apus pacificus			
Aquila audax			
Ardea modesta			
Ardenna pacifica			
Ardeotis australis			
Arenaria interpres			
Artamus minor			
Artamus cinereus			
Artamus leucorynchus			
Burhinus grallarius			
Butorides striatus			
Cacatua sanguinea			

Cacomantis pallidus			
Calidris acuminata			
Centropus phasianinus			
Charadrius ruficapillus			
Chroicocephalus novaehollandiae			
Chrysococcyx basalis			
Cincloramphus cruralis			
Circus assimilis			
Columba livia	Y		
Coracina novaehollandiae			
Corvus bennetti			
Corvus orru			
Cracticus nigrogularis			
Egretta garzetta			
Egretta novaehollandiae			
Egretta sacra			
Elanus axillaris			
Elseyornis melanops			
Emblema pictum			
Eolophus roseicapillus			
Ephippiorhynchus asiaticus			
Epthianura tricolor			
Erythrogonys cinctus			
Esacus magnirostris			
Falco berigora			
Falco cenchroides			

Falco longipennis			
Falco peregrinus			
Fregata ariel			
Gallirallus philippensis			
Gavicalis virescens			
Gelochelidon nilotica			
Geopelia cuneata			
Geopelia humeralis			
Geopelia striata			
Geophaps plumifera			
Gerygone tenebrosa			
Glareola maldivarum			
Grallina cyanoleuca			
Haematopus fuliginosus			
Haematopus longirostris			
Haematopus ostralegus			
Haliaeetus leucogaster			
Haliastur indus			
Haliastur sphenurus			
Hieraaetus morphnoides			
Himantopus himantopus			
Hirundo neoxena			
Hydroprogne caspia			
Lalage sueurii			
Lichmera indistincta			
Limosa lapponica			

Malurus leucopterus			
Manorina flavigula			
Melopsittacus undulatus			
Merops ornatus			
Milvus migrans			
Mirafra javanica			
Neochmia ruficauda			
Neopsephotus bourkii			
Numenius madagascariensis			
Numenius minutus			
Numenius phaeopus			
Nymphicus hollandicus			
Oceanites oceanicus			
Ocyphaps lophotes			
Pachycephala lanioides			
Pachycephala melanura			
Pachycephala rufiventris			
Pandion cristatus			
Pardalotus rubricatus			
Pardalotus striatus			
Passer domesticus	Y		
Passer montanus	Y		
Pelecanus conspicillatus			
Petrochelidon ariel			
Petrochelidon nigricans			
Phalacrocorax sulcirostris			

Phalacrocorax varius			
Phaps chalcoptera			
Podargus strigoides			
Ptilonorhynchus guttatus			
Ptilotula keartlandi			
Ptilotula penicillata			
Rhipidura leucophrys			
Rhipidura phasiana			
Smicrornis brevirostris			
Sterna dougallii			
Sterna hirundo			
Sula leucogaster			
Taeniopygia guttata			
Thalasseus bengalensis			
Thalasseus bergii			
Threskiornis spinicollis			
Todiramphus chloris			
Todiramphus pyrrhopygius			
Todiramphus sanctus			
Tringa brevipes			
Tringa totanus			
Tringanebularia			
Turnix velox			
Tyto javanica			
Xenus cinereus			
Zosterops luteus			
Mammal			

Felis catus	Y		
Nyctophilus geoffroyi			
Osphranter robustus			
Pseudantechinus roryi			
Pseudantechinus woolleyae			
Pseudomys delicatulus			
Pseudomys hermannsburgensis			
Rattus rattus	Y		
Taphozous georgianus			
Vespadelus finlaysoni			
Vulpes vulpes	Y		
Zyzomys argurus			
Reptile			
Acanthophis wellsei			
Anilios ammodytes			
Anilios grypus			
Antaresia perthensis			
Antaresia stimsoni			
Aspidites melanocephalus			
Carlia triacantha			
Crenadactylus horni			
Cryptoblepharus buchananii			
Cryptoblepharus ustulatus			
Ctenophorus caudicinctus			
Ctenophorus isolepis			
Ctenotus inornatus			
Ctenotus pantherinus			

Ctenotus rubicundus			
Ctenotus serventyi			
Cyclodomorphus melanops			
Delma pax			
Delma tincta			
Demansia rufescens			
Diplodactylus conspicillatus			
Diplodactylus galaxias			
Egernia pilbarensis			
Ephalophis greyi			
Eremiascincus isolepis			
Fordonia leucobalia			
Furina ornata			
Gehyra punctata			
Gehyra variegata			
Gowidon longirostris			
Hemidactylus frenatus	Y		
Heteronotia binoei			
Lerista bipes			
Lerista clara			
Lerista jacksoni			
Lerista muelleri			
Lialis burtonis			
Menetia greyii			
Menetia surda			
Morethia ruficauda			

Notoscincus ornatus			
Oedura fimbria			
Oedura marmorata			
Pseudechis australis			
Pseudonaja mengdeni			
Strophurus ciliaris			
Strophurus elderi			
Suta punctata			
Varanus eremius			
Varanus gouldii			

APPENDIX F: NATUREMAP DATABASE SEARCH (10 KM BUFFER)

Species	Naturalised	Conservation Code	Endemic To Query Area
Amphibian			
Cyclorana australis			
Cyclorana maini			
Litoria rubella			
Notaden nichollsi			
Bird			
Actitis hypoleucos		IA	
Aegotheles cristatus			
Anous stolidus subsp. Pileatus		IA	
Arenaria interpres		IA	
Artamus cinereus			
Artamus leucorynchus			
Artamus leucorynchus subsp. leucopygialis			
Artamus minor			
Burhinus grallarius			
Butorides striata			
Cacatua sanguinea			
Cacomantis pallidus			
Centropus phasianinus			
Charadrius leschenaultii		IA	
Charadrius ruficapillus			
Chroicocephalus novaehollandiae			
Coracina novaehollandiae			

Cracticus nigrogularis			
Dromaius novaehollandiae			
Elseyornis melanops			
Emblema pictum			
Eolophus roseicapillus			
Esacus magnirostris			
Falco berigora			
Falco cenchroides			
Falco peregrinus		S	
Gelochelidon nilotica		IA	
Geopelia cuneata			
Geopelia humeralis			
Geopelia striata			
Geophaps plumifera			
Gerygone tenebrosa			
Grallina cyanoleuca			
Haematopus fuliginosus			
Haematopus longirostris			
Haliaeetus leucogaster			
Haliastur indus			
Haliastur sphenurus			
Hirundo neoxena			
Larus novaehollandiae			
Lichmera indistincta			
Limosa lapponica		IA	
Manorina flavigula			

Melopsittacus undulatus			
Merops ornatus			
Milvus migrans			
Numenius madagascariensis		T	
Numenius phaeopus		IA	
Ocyphaps lophotes			
Pandion cristatus		IA	
Pardalotus rubricatus subsp. Rubricatus			
Pardalotus striatus			
Petrochelidon ariel			
Petrochelidon nigricans			
Phalacrocorax varius			
Pitta moluccensis			
Podargus strigoides			
Podargus strigoides subsp. brachypterus			
Ptilonorhynchus guttatus			
Rhipidura leucophrys			
Taeniopygia guttata			
Thalasseus bengalensis			
Thalasseus bergii		IA	
Todiramphus pyrrhopygius			
Todiramphus sanctus			
Tringa brevipes		P4	
Tringa nebularia			
Zosterops luteus			
Mammal			

Canis familiaris	Y		
Dasyurus hallucatus		T	
Felis catus	Y		
Macroderma gigas			
Macropus robustus			
Macropus robustus subsp. erubescens			
Macropus rufus			
Megaptera novaeangliae		S	
Mormopterus (Ozimops) cobourgianus			
Ningaui timealeyi			
Petrogale rothschildi			
Planigale sp. nov.			
Pseudantechinus roryi			
Pseudomys chapmani			
Pseudomys delicatulus			
Pseudomys hermannsburgensis			
Pteropus alecto			
Tachyglossus aculeatus			
Vulpes vulpes			
Reptile			
Acanthophis wellsei			
Acanthophis wellsi			
Antaresia perthensis			
Antaresia stimsoni			
Antaresia stimsoni subsp. stimsoni			
Aspidites melanocephalus			

Carlia munda			
Carlia triacantha			
Chelonia mydas		T	
Crenadactylus ocellatus subsp. horni			
Cryptoblepharus buchananii			
Cryptoblepharus plagiocephalus			
Cryptoblepharus ustulatus			
Ctenophorus caudicinctus subsp. caudicinctus			
Ctenotus leonhardii			
Ctenotus pantherinus subsp. ocellifer			
Ctenotus rubicundus			
Ctenotus saxatilis			
Ctenotus serventyi			
Cyclodomorphus melanops			
Cyclodomorphus melanops subsp. melanops			
Delma pax			
Demansia psammophis			
Demansia rufescens			
Diplodactylus conspicillatus			
Diplodactylus galaxias			
Diplodactylus savagei			
Ephalophis greyae			
Eremiascincus isolepis			
Eretmochelys imbricata subsp. bissa		T	
Fordonia leucobalia			

Furina ornata			
Gehyra punctata			
Gehyra variegata			
Hemidactylus frenatus	Y		
Heteronotia binoei			
Lerista bipes			
Lerista jacksoni			
Lerista muelleri			
Lialis burtonis			
Liasis olivaceus subsp. barroni		T	
Lucasium stenodactylum			
Menetia greyii			
Menetia surda subsp. surda			
Morethia ruficauda subsp. exquisita			
Natator depressus		T	
Notoscincus ornatus subsp. ornatus			
Oedura marmorata			
Pogona minor subsp. Minor			
Pseudechis australis			
Pseudonaja mengdeni			
Pseudonaja nuchalis			
Strophurus elderi			
Suta punctata			
Varanus acanthurus			
Varanus eremius			
Varanus giganteus			

Varanus gouldii			
Varanus panoptes subsp. rubidus			
Varanus pilbarensis			
Varanus tristis subsp. tristis			

AIZOACEAE	Trianthema portulacastrum
	Trianthema turgidifolium
AMARANTHACEAE	Aerva javanica
	Amaranthus undulatus
	Gomphrena cunninghamii
	Ptilotus nobilis
	Ptilotus obovatus
APOCYNACEAE	Cynanchum floribundum
ARALIACEAE	Trachymene oleracea
	Trachymene oleracea subsp. oleracea
ASTERACEAE	Angianthus milnei
	Bidens bipinnata
	Conyza bonariensis
	Pluchea rubelliflora
	Pterocaulon sphaeranthoides
	Sonchus oleraceus
	Tridax procumbens
BORAGINACEAE	Ehretia saligna var. saligna
BRASSICACEAE	Lepidium pedicellosum
CAPPARACEAE	Capparis spinosa subsp. nummularia
CELASTRACEAE	Stackhousia clementii
CHENOPODIACEAE	Neobassia astrocarpa
	Rhagodia preissii subsp. obovata
	Tecticornia halocnemoides
	Tecticornia indica subsp. indica
CLEOMACEAE	Cleome viscosa
COMBRETACEAE	Terminalia supranitifolia

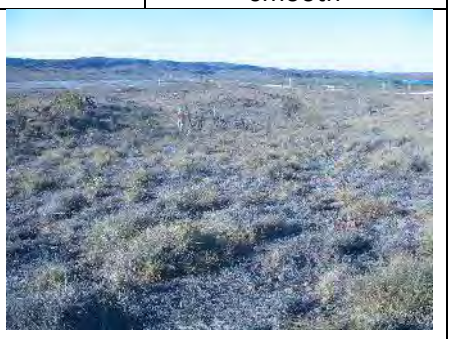
COMMELINACEAE	Commelina ensifolia
CONVOLVULACEAE	Bonamia pilbarensis
	Evolvulus alsinoides var. villosicalyx
	Ipomoea costata
CUCURBITACEAE	Cucumis variabilis
CYPERACEAE	Cyperus bifax
	Cyperus blakeanus
	Cyperus bulbosus
	Cyperus vaginatus
	Eleocharis geniculata
	Fimbristylis dichotoma
	Schoenoplectus subulatus
EUPHORBIACEAE	Euphorbia australis
	Euphorbia australis var. subtomentosa
	Euphorbia biconvexa
	Euphorbia careyi
	Euphorbia tannensis subsp. Eremophila
	Euphorbia trigonosperma
	Euphorbia vaccaria
FABACEAE	Acacia arida
	Acacia colei var. colei
	Acacia coriacea
	Acacia coriacea subsp. coriacea
	Acacia pyrifolia var. pyrifolia
	Clitoria ternatea
	Dichrostachys spicata
	Indigofera monophylla

	Leucaena leucocephala
	Rhynchosia australis
	Rhynchosia bungarensis
	Rhynchosia minima
	Stylosanthes hamata
	Swainsona pterostylis
	Tephrosia clementii
	Tephrosia sp.
	Tephrosia supina
	Vigna triodiophila
GENTIANACEAE	Centaurium erythraea
GOODENIACEAE	Goodenia lamprosperma
	Scaevola spinescens
LAMIACEAE	Clerodendrum tomentosum
	Clerodendrum tomentosum var. lanceolatum
LAURACEAE	Cassytha capillaris
LYTHRACEAE	Lawsonia inermis
MALVACEAE	Abutilon fraseri
	Brachychiton acuminatus
	Corchorus elachocarpus
	Corchorus trilocularis
	Corchorus walcottii
	Hibiscus sturtii
	Malvastrum americanum
	Sida fibulifera
	Triumfetta appendiculata
MOLLUGINACEAE	Trigastrotheca molluginea

MORACEAE	Ficus aculeata var. indecora
MYRTACEAE	Corymbia opaca
	Eucalyptus victrix
NYCTAGINACEAE	Boerhavia coccinea
	Boerhavia gardneri
OLEACEAE	Jasminum didymum subsp. Lineare
PASSIFLORACEAE	Passiflora foetida
PHYLLANTHACEAE	Flueggea virosa subsp. melanthesoides
PITTOSPORACEAE	Pittosporum phillyreoides
PLANTAGINACEAE	Stemodia grossa
POACEAE	Aristida contorta
	Cenchrus ciliaris
	Cenchrus setaceus
	Cenchrus setiger
	Chrysopogon fallax
	Cymbopogon ambiguus
	Dactyloctenium radulans
	Digitaria ctenantha
	Enneapogon caerulescens
	Enneapogon lindleyanus
	Eriachne tenuiculmis
	Paspalidium tabulatum
	Sporobolus australasicus
	Themeda sp.
	Themeda triandra
	Triodia angusta
	Triodia epactia

	Triodia wiseana
	Whiteochloa airoides
PROTEACEAE	Grevillea pyramidalis subsp. pyramidalis
	Hakea lorea subsp. lorea
RHIZOPHORACEAE	Ceriops australis
	Rhizophora stylosa
SOLANACEAE	Physalis angulata
	Solanum horridum
	Solanum lasiophyllum
	Solanum nigrum
VIOLACEAE	Hybanthus aurantiacus
ZYGOPHYLLACEAE	Tribulus terrestris

APPENDIX G: SURVEY SITE DETAILS

Site	1	**Soil Type**	Sandy clay loam
Date	19/11/18 & 11/05/19	**Soil Colour**	Brown
Aspect	WSW	**Landform**	Shallow gully
Seasonal Condition	Dry and Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	AbHITe	**Surface Rock Size and Shape**	0.2 – 0.5L blocky angular to weathered smooth
Vegetation Association	Tall shrubland of *Acacia bivenosa* over open shrubland of *Hakea lorea*, *Acacia colei* over hummock grassland of *Triodia epactia* over herbland.		
Condition	No Disturbances		
Site	2	**Soil Type**	Sandy clay loam
Date	19/11/18 & 11/05/19	**Soil Colour**	Brown
Aspect	S	**Landform**	Undulating mid slope
Seasonal Condition	Dry and Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	TeAb	**Surface Rock Size and Shape**	0.2 – 0.5L blocky angular to weathered smooth
Vegetation Association	*Triodia epactia* (Burrup Form) hummock grassland with scattered *Acacia bivenosa* shrubs		
Condition	Spinifex and shrubs. Culvert leakage caused some vegetation death		
Site	3	**Soil Type**	Sandy clay loam
Date	19/11/18 & 11/05/19	**Soil Colour**	Brown
Aspect	Flat	**Landform**	Rocky outcrop
Seasonal Condition	Dry and wet season	**Rock Type**	90
Fire Age	No evidence	**Rock Cover**	N/A
Vegetation Code	BaAclc	**Surface Rock Size and Shape**	Blocky 0.5 m - 1 m^3

Vegetation Association	Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea, Scaevola spinescens, Ipomoea costata* over herbs and very open grassland of *Triodia epactia* with *Cymbopogon ambiguus* and *Paspalidium clementii*		
Condition	No disturbances		
Site	4	**Soil Type**	Sandy clay loam
Date	19/11/18 & 11/05/19	**Soil Colour**	Brown
Aspect	S	**Landform**	Shallow gully to incised channel
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	65
Vegetation Code	ChAbSg	**Surface Rock Size and Shape**	Large - medium
Vegetation Association	*Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* (Burrup Form) hummock grassland		
Condition	Spinifex and shrubs. Culvert leakage caused some vegetation death		
Site	5	**Soil Type**	Sandy clay loam
Date	19/11/18 & 11/05/19	**Soil Colour**	Brown
Aspect	S	**Landform**	Lowers slopes / flats
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	50
Vegetation Code	AbImTe	**Surface Rock Size and Shape**	0.2 – 0.5L blocky angular to weathered smooth
Vegetation Association	*Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* scattered low shrubs to low open shrubland over *Triodia epactia* hummock grassland to closed hummock grassland		

Condition	Large dead area in the middle, likely culvert leakage caused vegetation death		
Site	6	**Soil Type**	Sandy clay
Date	19/11/18 & 11/05/19	**Soil Colour**	Brown
Aspect	S	**Landform**	Lowers slopes / flats with low boulder outcrops
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	80
Vegetation Code	AbTa	**Surface Rock Size and Shape**	small rocks and boulders
Vegetation Association	*Acacia bivenosa* high open shrubs over *Triodia angusta* (Burrup Form) hummock grassland		
Condition	No disturbances		
Site	7	**Soil Type**	Sand
Date	19/11/18 & 11/05/19	**Soil Colour**	Light brown
Aspect	S	**Landform**	Riparian salty mudflat margin
Seasonal Condition	Dry and wet season	**Rock Type**	Bluestone gravel
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	ThtTil	**Surface Rock Size and Shape**	Bluestone gravel
Vegetation Association	Dwarf open shrubland to heath (varies 2-10% to 20-40%) of *Tecticornia halocnemoides* with *Tecticornia indica*		
Condition	15% weed coverage. Vehicle tracks have dissected the vegetation and road building gravel has spilled onto it		
Site	8	**Soil Type**	Sand
Date	19/11/18 and 11/05/19	**Soil Colour**	Light brown
Aspect	Flat	**Landform**	Riparian sand bank
Seasonal Condition	Dry and wet season	**Rock Type**	No rocks
Fire Age	No evidence	**Rock Cover**	0
Vegetation Code	(Te)Sv	**Surface Rock Size and Shape**	N/A

Vegetation Association	*Grassland of Sporobolous virginicus, Eriachne mucronata and Paspalidium tabulatum (30-70%) with scattered Triodia epactia. *Cenchrus ciliaris and *Aerva javanica are common in wet season.*		
Condition	No disturbances		
Site	9	**Soil Type**	Sandy clay loam
Date	19/11/18 & 13/05/19	**Soil Colour**	Light brown
Aspect	N	**Landform**	Lower slopes
Seasonal Condition	Dry and wet season	**Rock Type**	Laterite and granite
Fire Age	No evidence	**Rock Cover**	40% gravel, 40% rock
Vegetation Code	AbTe*Cc	**Surface Rock Size and Shape**	2-20 cm
Vegetation Association	Previously disturbed and rehabilitated. *Acacia bivenosa* tall shrubland (30-70%, 2.5m) over Hummock Grassland of *Triodia epactia* (30-70%) with **Cenchrus ciliaris*		
Condition	Previously disturbed and rehabilitated.		
Site	10	**Soil Type**	Loam
Date	19/11/18 & 13/05/19	**Soil Colour**	Brown
Aspect	Flat	**Landform**	Rocky outcrop running north - south
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	FbBaTsSc	**Surface Rock Size and Shape**	Blocky 0.5 m - 1m³
Vegetation Association	Open low woodland of *Ficus brachypoda*, *Brachychiton acuminatus*, *Terminalia supranitifolia* over mixed shrubland of *Acacia coriacea*, *Scaevola spinescens*, *Rhagodia preissii* subsp *obovate* over open *Cymbopogon ambiguus* with *Triodia epactia*		
Condition	No disturbances		
Site	11	**Soil Type**	N/A
Date	20/11/18 & 12/11/19	**Soil Colour**	N/A

Aspect	Flat	**Landform**	Rocky outcrop running south-west
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	FbBaTsSc	**Surface Rock Size and Shape**	Large boulders
Vegetation Association	Open low woodland of *Ficus brachypoda*, *Brachychiton acuminatus*, *Terminalia supranitifolia* over mixed shrubland of *Acacia coriacea*, *Scaevola spinescens*, *Rhagodia preissii* subsp *obovate* over open *Cymbopogon ambiguus* with *Triodia epactia*		
Condition	No disturbances		
Site	12	**Soil Type**	Sandy clay loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Lower slopes
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	TeTh	**Surface Rock Size and Shape**	Blocky – rounded, 0.2 m -0.5 m³
Vegetation Association	*Triodia epactia*, *Themeda triandra* hummock/tussock grassland		
Condition	Garden waste pile in track edge		
Site	13	**Soil Type**	N/A
Date	20/11/18 & 12/05/19	**Soil Colour**	N/A
Aspect	Flat	**Landform**	Rocky outcrop in south-west
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	FbBaTsSc	**Surface Rock Size and Shape**	Blocky – rounded, 0.2 m -0.5 m³
Vegetation Association	Open low woodland of *Ficus brachypoda*, *Brachychiton acuminatus*, *Terminalia supranitifolia* over mixed shrubland of *Acacia coriacea*, *Scaevola spinescens*, *Rhagodia preissii* subsp *obovate* over open *Cymbopogon ambiguus* with *Triodia epactia*		
Condition	No disturbances		
Site	14	**Soil Type**	Sandy clay loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Mid slopes/flats near drainage
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	< 2 years	**Rock Cover**	70

Vegetation Code	AbCgTe	**Surface Rock Size and Shape**	Small rocks
Vegetation Association	*Acacia bivenosa*, *Cassia glutinosa* open shrubland to shrubland over *Triodia epactia* (Burrup Form), **Cenchrus ciliaris* grassland		
Condition	Acacia regrowth post fire		
Site	15	**Soil Type**	Sandy loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Lower slopes/plains at bottom of rocky hills
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	70
Vegetation Code	GpCwTe	**Surface Rock Size and Shape**	0.2 - 0.5L blocky angular to weathered smooth
Vegetation Association	*Grevillea pyramidalis subsp. pyramidalis* open heath over *Corchorus walcottii* scattered low shrubs to low open heath over *Triodia epactia* (Burrup Form) hummock grassland		
Condition	No disturbance. Adjacent to camp area		
Site	16	**Soil Type**	Sandy loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Lower slopes/plains at bottom of rocky hills
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	70
Vegetation Code	EvDsTa	**Surface Rock Size and Shape**	0.2 - 0.5L blocky angular to weathered smooth

Vegetation Association	*Eucalyptus victrix* scattered low trees to low open woodland over *Dichrostachys spicata*, (*Acacia coriaceae subsp. coriaceae*) tall scattered shrubs to low open shrubland over *Triodia angusta* hummock grassland		
Condition	Small amount of *Cc		
Site	17	**Soil Type**	Sandy clay loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Lower slopes
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	60
Vegetation Code	TaTsRm	**Surface Rock Size and Shape**	Mostly rounded. 0.2 - 2L
Vegetation Association	*Triodia angusta*, *Triodia epactia* grassland with *Tephrosia supina* herbland and *Rhyncosia minima lianes*		
Condition	Immediately adjacent to disturbed ripped rehab area		
Site	18	**Soil Type**	Sandy clay loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Lower slopes
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	40
Vegetation Code	TcEtSe	**Surface Rock Size and Shape**	Mostly rounded. 0.2 - 2L
Vegetation Association	*Terminalia canescens* low woodland over *Eriachne tenuiculmis*, *Triodia epactia* grassland/hummock grassland with *Sesbania cannabina* herbland		
Condition	Shrubs and trees coated in thick dust		
Site	19	**Soil Type**	Sandy clay loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown

Aspect	N	**Landform**	Lower slopes/transition to flats
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	0
Vegetation Code	Ev*CcTe	**Surface Rock Size and Shape**	N/A
Vegetation Association	*Eucalyptus victrix* over *Pittosporum phylliraeoides var. phylliraeoides / Rhagodia eremaea* over **Cenchrus ciliaris / Triodia epactia*		
Condition	Some clearing of understory and ground cover.		
Site	20	**Soil Type**	Sandy clay loam
Date	20/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Lower slopes - plain
Seasonal Condition	Dry and wet Season	**Rock Type**	Granite
Fire Age	< 2 years	**Rock Cover**	60
Vegetation Code	ChImTe	**Surface Rock Size and Shape**	Rounded 0.2 - 0.5L
Vegetation Association	*Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa, Acacia coriaceae subsp. coriaceae*) scattered tall shrubs over (*Dichrostachys spicata*) scattered shrubs over *Indigofera monophylla*		
Condition	One large Ch. Mostly small coppiced. Limited Te regrowth		
Site	21	**Soil Type**	Clay loam
Date	20/11/18 & 13/05/19	**Soil Colour**	Brown
Aspect	W	**Landform**	Rocky outcrop, slope
Seasonal Condition	Dry and wet Season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	BaAcIc	**Surface Rock Size and Shape**	Blocky rectangular 0.2 - 2 m^3

Vegetation Association	Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea, Scaevola spinescens, Ipomoea costata* over herbs and very open grassland of *Triodia epactia* with *Cymbopogon ambiguus* and *Paspalidium clementii*		
Condition	N/A		
Site	22	**Soil Type**	Loam
Date	20/11/18 & 13/05/19	**Soil Colour**	Brown
Aspect	Flat	**Landform**	Island inside creek bend. Accumulated silt
Seasonal Condition	Dry and wet Season	**Rock Type**	No rocks
Fire Age	No evidence	**Rock Cover**	0
Vegetation Code	EvAa	**Surface Rock Size and Shape**	N/A
Vegetation Association	*Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus, Eriachne tenuiculmis, Triodia angusta* (Burrup form) sedgeland and tussock/hummock grassland		
Condition	Extensive passion vine weed cover. Heavy animal traffic flow		
Site	23	**Soil Type**	Sandy clay loam
Date	20/11/18 & 13/05/19	**Soil Colour**	Light brown
Aspect	W / NW	**Landform**	Incised creek channel
Seasonal Condition	Dry and wet Season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	15
Vegetation Code	EvAbTa	**Surface Rock Size and Shape**	Small rocks
Vegetation Association	*Eucalyptus victrix* over *Acacia bivenosa* over *Triodia angusta* (Burrup Form)		
Condition	passion vine weed cover. Heavy animal traffic flow		
Site	24	**Soil Type**	Loam
Date	20/11/2018	**Soil Colour**	Brown
Aspect	NE	**Landform**	Rocky outcrop

Seasonal Condition	Dry Season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	BaAcIc	**Surface Rock Size and Shape**	Large blocky rock, infill areas with soil, 0.25 - 2 m^3, infill 0.5 - 2L
Vegetation Association	*Brachychiton acuminatus* over *Acacia coriacea* / *Scaevola spinescens* / *Ipomoea costata* over herbs / *Triodia epactia* / *Cymbopogon ambiguus* / *Paspalidium clementii*		
Condition	No disturbances		
Site	25	**Soil Type**	Clay loam
Date	21/11/2018	**Soil Colour**	Brown
Aspect	S / W	**Landform**	Upper slopes over a crest
Seasonal Condition	Dry Season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	95
Vegetation Code	TeRm	**Surface Rock Size and Shape**	Block 2-250L
Vegetation Association	*Triodia epactia* hummock grassland with *Rhynchosia minima* lianes		
Condition	Noise and light from processing plant		
Site	26	**Soil Type**	N/A
Date	21/11/2018	**Soil Colour**	N/A
Aspect	W	**Landform**	Rocky outcrop
Seasonal Condition	Dry season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	BaAcIc	**Surface Rock Size and Shape**	Blocky 2L - 1.5m^3
Vegetation Association	Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea, Scaevola spinescens, Ipomoea costata* over herbs and very open grassland of *Triodia epactia* with *Cymbopogon ambiguus* and *Paspalidium clementii*		

Condition	No disturbances		
Site	27	**Soil Type**	Clay loam
Date	21/11/2018	**Soil Colour**	Brown
Aspect	E	**Landform**	Eastern lower slope below small rocky outcrop
Seasonal Condition	Dry season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	TeCa	**Surface Rock Size and Shape**	Blocky 2L - 50L
Vegetation Association	*Triodia epactia*, *Cymbopogon ambiguus* hummock/tussock grassland		
Condition	No disturbances		
Site	28	**Soil Type**	Clay loam
Date	21/11/18 & 13/05/19	**Soil Colour**	Brown
Aspect	S	**Landform**	Lower slopes/plains
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	85
Vegetation Code	Tw	**Surface Rock Size and Shape**	Blocky 0.1 - 0.25L
Vegetation Association	*Triodia wiseana* hummock grasslands		
Condition	N/A		
Site	29	**Soil Type**	Sand - loamy sand
Date	21/11/18 & 13/05/19	**Soil Colour**	Pale Brown
Aspect	Flat	**Landform**	Sandbank 1m deep above mudflats
Seasonal Condition	Dry and wet season	**Rock Type**	No rocks
Fire Age	No evidence	**Rock Cover**	0
Vegetation Code	(Te)Sv	**Surface Rock Size and Shape**	N/A

Vegetation Association	Grassland of *Sporobolous virginicus*, *Eriachne mucronata* and *Paspalidium tabulatum* (30-70%) with scattered *Triodia epactia*. Evidence that **Cenchrus ciliaris* and **Aerva javanica* are common in wet season.		
Condition	Kapok cover high in wet season		
Site	30	**Soil Type**	Clay loam
Date	21/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	lower plains drop into samphire. Lateritic cliffs infront of mudflats
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	AbTa	**Surface Rock Size and Shape**	Blocky 50 - 100 mL
Vegetation Association	*Acacia bivenosa* high open shrubs over *Triodia angusta* hummock grassland		
Condition	Clearing and rehab to south adjacent to vegetation. Vegetation in poor condition, coated in dust		
Site	31	**Soil Type**	Sandy, shell rich
Date	21/11/18 & 12/05/19	**Soil Colour**	Pale brown/grey
Aspect	Flat	**Landform**	Lower slopes/ plain rehab
Seasonal Condition	Dry and wet season	**Rock Type**	No rocks
Fire Age	No evidence	**Rock Cover**	0
Vegetation Code	AbTe*Cc	**Surface Rock Size and Shape**	Many shells and old coral
Vegetation Association	Previously disturbed and rehabilitated. *Acacia bivenosa* tall shrubland (30-70%, 2.5m) over Hummock Grassland of *Triodia epactia* (30-70%) with **Cenchrus ciliaris*		
Condition	Rehabilitated area. Dense weed cover. Dust coating on shrubs.		

Site	32	**Soil Type**	Clay loam
Date	21/11/18 &12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Mid slopes
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	ChImTe	**Surface Rock Size and Shape**	Mostly rounded 0.25 - 0.5L
Vegetation Association	*Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa, Acacia coriaceae subsp. coriaceae*) scattered tall shrubs over (*Dichrostachys spicata*) scattered shrubs over *Indigofera monophylla*		
Condition	Weeds present		
Site	33	**Soil Type**	Sandy clay loam
Date	21/11/18 & 15/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Mid slopes
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	85
Vegetation Code	TeTh	**Surface Rock Size and Shape**	00.25 - 25L
Vegetation Association	*Triodia epactia*, *Themeda triandra* hummock/tussock grassland		
Condition	Rehabilitated		
Site	34	**Soil Type**	Clay loam / sand
Date	21/11/18 & 13/05/19	**Soil Colour**	Brown / white
Aspect	N	**Landform**	Flats between lower slopes and mudflats
Seasonal Condition	Dry and wet season	**Rock Type**	Granite and calcareous
Fire Age	No evidence	**Rock Cover**	20
Vegetation Code	AbTe*Cc	**Surface Rock Size and Shape**	0.25 - 25L

Vegetation Association	Previously disturbed and rehabilitated. *Acacia bivenosa* tall shrubland (30-70%, 2.5m) over Hummock Grassland of *Triodia epactia* (30-70%) with **Cenchrus ciliaris*		
Condition	Rehabilitated. *Cc. Some shrubs covered in dust		
Site	35	**Soil Type**	Clay loam - cracking clays
Date	22/11/18 & 13/05/19	**Soil Colour**	Pinkish
Aspect	Mounds and Channels	**Landform**	Road building bunds and drainage channels
Seasonal Condition	Dry and wet season	**Rock Type**	No rocks
Fire Age	No evidence	**Rock Cover**	0
Vegetation Code	(Te)Sv	**Surface Rock Size and Shape**	N/A
Vegetation Association	Grassland of *Sporobolous virginicus, Eriachne mucronata* and *Paspalidium tabulatum* (30-70%) with scattered *Triodia epactia.* Evidence that **Cenchrus ciliaris* and **Aerva javanica* are common in wet season.		
Condition	Disturbed. Spontaneous regeneration		
Site	36	**Soil Type**	Loam
Date	22/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Gully, approximately 25 m in the mid-slopes
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	85
Vegetation Code	ChAbTe	**Surface Rock Size and Shape**	Mostly rounded 0.025 - 0.5L
Vegetation Association	*Corymbia hamersleyana* scattered trees to low open woodland over *Acacia bivenosa* open shrubland over *Triodia epactia* open to closed hummock grassland		
Condition	Vehicle tracks through centre		
Site	37	**Soil Type**	Clay loam

Date	22/11/18 & 12/05/19	**Soil Colour**	Brown
Aspect	N	**Landform**	Lower slope
Seasonal Condition	Dry and wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	40
Vegetation Code	*CcTs	**Surface Rock Size and Shape**	0.2 - 2L
Vegetation Association	**Cenchrus ciliaris*, (*Triodia epactia*), (*Triodia angusta*) grassland/hummock grassland with *Tephrosia supina*, *Rhyncosia minima* herbland		
Condition	Previously disturbed. Weeds present		
Site	38	**Soil Type**	Loamy sand - sandy loam
Date	22/11/18 & 12/05/19	**Soil Colour**	Brown - pale grey
Aspect	N	**Landform**	Mid slope
Seasonal Condition	Dry and wet Season	**Rock Type**	Granite and calcareous
Fire Age	No evidence	**Rock Cover**	20
Vegetation Code	ChTh	**Surface Rock Size and Shape**	0.02 - 0.05L
Vegetation Association	*Corymbia hamersleyana* scattered low trees to low woodland over *Acacia bivenosa*, *Acacia colei*, scattered tall shrubs to low open shrubland over *Indigofera monophylla* over *Triodia epactia*, *Themeda triandra* hummock/tussock grassland		
Condition	dead Acacia shrubs likely caused from thick dust coating		
Site	39	**Soil Type**	Clay loam
Date	22/11/18 & 13/05/19	**Soil Colour**	Brown
Aspect	S	**Landform**	Lower slope, undulating large rocks
Seasonal Condition	Dry and wet Season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	100
Vegetation Code	AbHlCwTe	**Surface Rock Size and Shape**	0.25 - 1m³

Vegetation Association	High shrubland of *Acacia bivenosa* with scattered *Hakea lorea*, *Dolichandrone heterophylla*, *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* with occasional *Triodia angusta*		
Condition	N/A		
Site	40	**Soil Type**	Clay loam
Date	22/11/18 & 15/05/19	**Soil Colour**	Brown
Aspect	S	**Landform**	Lower slope, shallow drainage line
Seasonal Condition	Dry and Wet Season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	80
Vegetation Code	AiGpTe	**Surface Rock Size and Shape**	0.2 - 1L
Vegetation Association	Tall shrubland of *Acacia inaequilatera* and *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* (Burrup Form) over herbland of *Gomphrena cunninghamii*, *Abutilon lepidum, Trichodesma zeylanicum, Trachymene oleracea*		
Condition	No disturbances		

Site	41	**Soil Type**	Clay loam
Date	14/05/2019	**Soil Colour**	Brown
Aspect	south	**Landform**	Low rocky rise
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	TeRm	**Surface Rock Size and Shape**	blocky 2L to 50L
Vegetation Association	*Triodia epactia* hummock grassland with *Rhynchosia minima* lianes		
Condition	No Disturbances		

Site	42	**Soil Type**	Sand/shells
Date	15/05/2019	**Soil Colour**	White
Aspect	north	**Landform**	Sandbank
Seasonal Condition	Wet season	**Rock Type**	No rocks
Fire Age	No signs of fire	**Rock Cover**	-
Vegetation Code	ThtTil	**Surface Rock Size and Shape**	-
Vegetation Association	Dwarf open shrubland to heath (varies 2-10% to 20-40%) of *Tecticornia halocnemoides* with *Tecticornia indica*		
Condition	Buffel grass on the margins, evidence of land clearing for road building and some evidence of ripping		
Site	43	**Soil Type**	Sand
Date	15/05/2019	**Soil Colour**	White
Aspect	north	**Landform**	Mudflat margins
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	70
Vegetation Code	Tht	**Surface Rock Size and Shape**	Blocky 0.1 – 0.25 L
Vegetation Association	Dwarf scattered (<2%) to open (2-10% <0.5m) shrubland of *Tecticornia halocnemoides*		
Condition	No disturbances		
Site	54	**Soil Type**	Sand
Date	15/05/2019	**Soil Colour**	White
Aspect	north	**Landform**	Mudflat margins
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	70
Vegetation Code	Tht	**Surface Rock Size and Shape**	Blocky 0.1 – 0.25 L

Vegetation Association	Dwarf scattered (<2%) to open (2-10% <0.5m) shrubland of *Tecticornia halocnemoides*		
Condition	No disturbances		
Site	45	**Soil Type**	Sand
Date	15/05/2019	**Soil Colour**	White
Aspect	north	**Landform**	Mudflat margins
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	75
Vegetation Code	Tht	**Surface Rock Size and Shape**	Blocky 0.1 – 0.25 L
Vegetation Association	Dwarf scattered (<2%) to open (2-10% <0.5m) shrubland of *Tecticornia halocnemoides*		
Condition	No disturbances		
Site	46	**Soil Type**	Sand/shell
Date	15/05/2019	**Soil Colour**	White
Aspect	-	**Landform**	sandbank
Seasonal Condition	Wet season	**Rock Type**	No rock
Fire Age	No evidence	**Rock Cover**	-
Vegetation Code	(Te)Sv	**Surface Rock Size and Shape**	-
Vegetation Association	Grassland of *Sporobolous virginicus, Eriachne mucronata* and *Paspalidium tabulatum* (30-70%) with scattered *Triodia epactia.* Evidence that **Cenchrus ciliaris* and **Aerva javanica* are common in wet season.		
Condition	Weeds Buffel grass and Kapok. Infrastructure pipelines cut through this		
Site	47	**Soil Type**	Loam
Date	15/05/2019	**Soil Colour**	brown

Aspect	S	**Landform**	Lower slopes/flats
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	60
Vegetation Code	AbTa	**Surface Rock Size and Shape**	Rounded 0.2 to 5 L
Vegetation Association	*Acacia bivenosa* high open shrubs over *Triodia angusta* hummock grassland		
Condition	A few scattered Kapok		
Site	48	**Soil Type**	Sand
Date	15/05/2019	**Soil Colour**	White
Aspect	Flat	**Landform**	sand bank
Seasonal Condition	Wet season	**Rock Type**	No rocks
Fire Age	No evidence	**Rock Cover**	0
Vegetation Code	(Te)Sv	**Surface Rock Size and Shape**	N/A
Vegetation Association	Grassland of *Sporobolous virginicus, Eriachne mucronata* and *Paspalidium tabulatum* (30-70%) with scattered *Triodia epactia.* Evidence that **Cenchrus ciliaris* and **Aerva javanica* are common in wet season.		
Condition	Kapok and Buffel grass common		
Site	49	**Soil Type**	clay loam
Date	15/05/2019	**Soil Colour**	brown
Aspect	S	**Landform**	Lower slopes
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	50
Vegetation Code	AbHlCwTe	**Surface Rock Size and Shape**	Blocky 2 L to 50 L
Vegetation Association	High shrubland of *Acacia bivenosa* with scattered *Hakea lorea*, *Scaevola spinescens*, *Grevillea pyramidalis* over open dwarf shrubland of *Corchorus walcottii* over hummock grassland of *Triodia epactia* with occasional *Triodia angusta*. There are small groves of		

	Dolichandrone heterophylla within this association.		
Condition	A few scattered Kapok		
Site	50	**Soil Type**	Loam
Date	15/05/2019	**Soil Colour**	Brown
Aspect	s	**Landform**	Upper slopes
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	60
Vegetation Code	AiGpTe	**Surface Rock Size and Shape**	Blocky 0.2 to 10 L
Vegetation Association	Tall shrubland of *Acacia inaequilatera* and *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* over herbland of *Gomphrena cunninghamii*, *Abutilon lepidum*, *Trichodesma zeylanicum*, *Trachymene oleracea*		
Condition	No disturbances		
Site	51	**Soil Type**	Loam
Date	15/05/2019	**Soil Colour**	Brown
Aspect	E	**Landform**	Below low outcrop
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	TeCa	**Surface Rock Size and Shape**	0.2 to 2 L
Vegetation Association	*Triodia epactia*, *Cymbopogon ambiguus* hummock/Tussock grassland		
Condition	No disturbances		
Site	52	**Soil Type**	Loam
Date	15/05/2019	**Soil Colour**	Brown
Aspect	E	**Landform**	Below low outcrop
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	90
Vegetation Code	TeCa	**Surface Rock Size and Shape**	0.2 to 2 L
Vegetation Association	*Triodia epactia*, *Cymbopogon ambiguus* hummock/Tussock grassland		
Condition	No disturbances		
Site	53	**Soil Type**	Sand/shells
Date	15/05/2019	**Soil Colour**	white
Aspect	Flat	**Landform**	Sandbank
Seasonal Condition	Wet season	**Rock Type**	No rocks
Fire Age	No evidence	**Rock Cover**	-

Vegetation Code	ThtTil	**Surface Rock Size and Shape**	-
Vegetation Association	Dwarf open shrubland to heath (varies 2-10% to 20-40%) of *Tecticornia halocnemoides* with *Tecticornia indica*		
Condition	Some Kapok and Buffel grass on the landward margin		
Site	54	**Soil Type**	loam
Date	15/05/2019	**Soil Colour**	Brown
Aspect	S	**Landform**	lower slopes
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	70
Vegetation Code	TeRm	**Surface Rock Size and Shape**	0.2 to 2 L
Vegetation Association	*Triodia epactia hummock grassland with Rhynchosia minima lianes*		
Condition	No disturbances		
Site	55	**Soil Type**	Sandy
Date	15/05/2019	**Soil Colour**	Light Brown
Aspect	west	**Landform**	Drainage
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	80
Vegetation Code	1999 4a	**Surface Rock Size and Shape**	0.2 - 0.2L weathered smooth
Vegetation Association	Low Woodland-Forest B (20-50%) of *Terminalia circumulata* and *Eucalyptus victrix* with Low Scrub B (10-30%, 1-1.5m*)* and Open Grassland (10-30%)		
Condition	No disturbance but drainage feature impeded by infrastructure to the east and west.		
Site	56	**Soil Type**	Sand
Date	15/05/2019	**Soil Colour**	white
Aspect	S	**Landform**	Sandbank
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	20
Vegetation Code	*Cc*AjTt	**Surface Rock Size and Shape**	gravel

Vegetation Association	Disturbed not rehabilitated area of **Cenchrus ciliaris *Aerva javanica* and *Trianthema turgidifolia*		
Condition	Completely degraded, spontaneous growth of Kapok, Buffel grass and *T. turgidifolia* following disturbance for infrastructure.		
Site	57	**Soil Type**	clay loam
Date	15/05/2019	**Soil Colour**	Brown
Aspect	S	**Landform**	Lower slopes
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	70
Vegetation Code	AiGpTe	**Surface Rock Size and Shape**	2 – 50 L
Vegetation Association	Tall shrubland of *Acacia inaequilatera* and *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* over herbland of *Gomphrena cunninghamii, Abutilon lepidum, Trichodesma zeylanicum, Trachymene oleracea*		
Condition	Between gas pipeline and road and cleared area, otherwise no disturb.		
Site	58	**Soil Type**	loam
Date	15/05/2019	**Soil Colour**	Red/brown
Aspect	S	**Landform**	Lower slopes
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	70
Vegetation Code	Te	**Surface Rock Size and Shape**	2-50 L
Vegetation Association	*Triodia epactia* hummock grassland. Associated species include *Grevillea pyramidalis* subsp. *pyramidalis* and *Indigofera monophyla.*		
Condition	Between gas pipeline and road, otherwise no disturb.		
Site	59	**Soil Type**	Clay loam
Date	15/05/2019	**Soil Colour**	Brown

Aspect	west	**Landform**	Mid slopes
Seasonal Condition	Wet season	**Rock Type**	Granite
Fire Age	No evidence	**Rock Cover**	65
Vegetation Code	TeAb	**Surface Rock Size and Shape**	0.2 – 10L
Vegetation Association	*Triodia epactia* hummock grassland with scattered *Acacia bivenosa* shrubs		
Condition	Between gas pipeline and road, otherwise no disturb.		

APPENDIX H: CONSERVATION SIGNIFICANT FAUNA (TERRESTRIAL) RECORDED WITHIN DATABASE SEARCHES AND DURING FIELD SURVEY(S)

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Birds							
Accipiter fasciatus	Brown Goshawk	M[1]	-	Hunts over forest and woodland, dry scrub and farmland. Feeds on small birds and ground-dwelling rodents and mammals, catching them in flight or on the ground. This species is common and sedentary.	Recorded	Yes	This species has been recorded historically recorded within the Burrup Peninsula (Worley Astron, 2006). Suitable foraging and nesting habitat exists in the Project Area for this species, though was not recorded during the pre-wet season survey. Recorded in Worley Astron (2006).
Acrocephalus australis	Australian Reed-Warbler	M	-	A common migrant. This species inhabits dense reedbeds alongside water but can utilise tall crops and bamboo thickets as well.	Low	No	No suitable habitat exists in the Project Area. The species has been recorded in near-coastal wetland areas in scattered locations within Dampier and the Burrup Peninsula.
Actitis hypoleucos	Common Sandpiper	M, IA[2]	IA	Though typically associated with estuaries, mangroves and creeks, this species is known to occupy small river pools, areas of inundation and flooding, particularly as water recedes. It is also commonly observed on artificial water bodies, such as sewage ponds. Across its distribution it is widespread in small numbers.	Low	Yes	This species has been recorded in the Dampier region on the Roly Rock islet and other islets in the archipelago (DBCA, 2018). Records indicate the species prefers the mangroves and intertidal pools present on many of the islands in the archipelago. Recorded in Worley Astron, 2006.

[1] Listed as a Marine species under the *EPBC Act* (1999).

[2] Listed as a Migratory species under International Agreement under the *EPBC Act* (1999).

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Anous stolidus	Common Noddy	M, IA	IA	Resides and breeds within coastal waters near island colonies during migration.	Low	No	This species has been recorded at Withnell Bay, west of Project Area (DBCA, 2018). Only one bird was recorded. The species can form large colonies on some islands utilising seaweed and other plant material to build a nest on the ground or dense coastal shrubbery. This species is a short-term visitor between May and October, and potential breeding habitat is not expected to be impacted by the Project.
Anthus novaeseelandiae	Australasian Pipit	M	-	Inhabits grasslands, forest clearings, grassy woodlands, semi-open scrub, beaches and hind-dunes and grassy roadsides. Nests in depressions sheltered by rock or clumps of vegetation.	Recorded	Yes	This species was recorded during the pre-wet season survey. This species can be considered locally nomadic and common, and breeds between August and December. Given its widespread distribution, and broad availability of suitable and undisturbed habitat in the greater Pilbara, the Project is not expected to impact populations of this species.
Apus pacificus	Fork-tailed Swift	M, IA	IA	This species flies over inland plains but also occasionally foothills or coastal areas, such as beaches and islands and well out to sea. They occur over dry or open habitats comprising of riparian woodland, low scrub, heathland or saltmarsh, also grasslands and sandplains with spinifex (Morcombe, 2011).	Low	Yes	This species has been historically recorded in the Dampier region on Enderby Island (DBCA, 2018). There are scattered records along the coast from south-west Pilbara to the north and east Kimberley. This species is almost exclusively aerial and has a wide range of suitable habitats for foraging. The species nests on island cliff faces and would not be reliant on any habitat within the Project Area. Recorded in Worley Astron 2006.
Ardea alba	Great Egret	M	-	Inhabits floodwaters, rivers, shallows of wetlands and intertidal mudflats.	Low	Yes	Common and widespread in any suitable permanent or temporary habitat. Recorded in Worley Astron 2006.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Ardea ibis	Cattle Egret	M		Often congregates in flocks amongst cattle. It frequents moist pastures with tall grass, open and shallow wetlands and mudflats. Species is common across northern Australia.	Moderate	Yes	This species was identified in the EPBC PMST. The species may use the temporarily flooded mudflats present in the Project Area during the wet season. The species has not been recorded during any surveys in the area before.
Ardenna pacifica	Wedge-tailed Shearwater	M, IA	IA	Frequents pelagic oceans, feeding across the surface, especially where deep water meets inshore water.	Low	No	This species has been recorded on Quartermaine Island off Rosemary in the Dampier Archipelago (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). This species would not be likely to use any habitat in the Project Area, especially as breeding and foraging is undertaken on offshore islands.
Arenaria interpres	Ruddy Turnstone	M, IA	IA	Resides on ocean coasts with exposed rock, stony or shell beaches, but also mudflats and sometimes inland on shallow pools.	Moderate	Yes	This species has been recorded on Roly Rock, a small, distant island off the coast of Dampier, King Bay and Cowrie Cove on the Burrup Peninsula (DBCA, 2018). This species is common. Given their preference for foraging on exposed reefs and under beach stones and seaweed, this species is more likely to be reliant on coastal areas, which will not be directly impacted by the Project.
Cacomantis pallidus	Pallid Cuckoo	M	-	Forages on ground and foliage, feeding on large insects, even hairy caterpillars. Inhabits open areas, avoiding dense closed vegetation. Lays egg in other bird open cup nests, pushing out other bird's eggs/chicks.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM during the post-wet season survey. Suitable foraging and breeding habitat is present within the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Calidris acuminata	Sharp-tailed Sandpiper	M, IA	IA	Scarce to moderately common. Widespread in coastal and interior wetlands. Mudflats in tidal zones, salt marshes or in fresh/saline/brackish inland water bodies.	Low	Yes	This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). The Project Area may provide some foraging habitat however, the species is widespread and has broad habitat requirements – it would not rely on the habitats present in the Project Area for the short time it is available during the wet season.
Calidris alba	Sanderling	M, IA	IA	Open, sandy beaches washed by ocean swells.	Low	No	This species has been recorded on Roly Rock, a small, distant island off the coast of Dampier (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). It is a regular migrant, and often seen in large flocks on favoured beaches, however it is rarely recorded using inland wetlands, saltponds and samphire flats. This species is unlikely to occur.
Calidris canutus	Red Knot	EN, M, IA	EN, IA	In close proximity to coastal waters such as mudflats and sandflats in estuaries. Also known to occur in salt ponds and salt lakes near the coast.	Moderate	Yes	This species has been recorded in the Dampier region (DBCA, 2018) and less recently on the Burrup Peninsula (Worley Astron, 2006). The species is known to follow tide edges when foraging, and can be seen with many other shore birds, such as the Red-necked Stint, which was recorded on site, within the samphire habitat. Given the proximity to Hearson's Cove, and the presence of open flats within the Project Area, this species may use the area for both foraging and roosting. This species was not recorded on either of APM's surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Calidris ferruginea	Curlew Sandpiper	CR, M, IA	CR, IA	Known to occupy drying near-coastal freshwater lakes and swamps. Predominantly occurring in the shallows of estuaries and attracted to near-coastal water bodies, such as salt ponds, salt lakes, sewage ponds, beaches and freshwater swamps and lakes.	Moderate	Yes	This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). This species may use the Project Area during the wet season, though records suggest that the species prefers undisturbed islands and islets.
Calidris melanotos	Pectoral Sandpiper	M, IA	IA	Utilises fresh and saline coastal wetlands, and also inland permanent or temporary wetlands. Prefers mudflats with fringing vegetation or swamps with heavy overgrowth of vegetation.	Low	Yes	Regular but uncommon in Australia, and generally occurs in the southeast. Though the habitat for this species is suitable in the Project Area, the mudflats are very open and there are no true dense swampy areas. This species preferred habitat is not present.
Calidris ruficollis	Red-necked Stint	M, IA	IA	Inhabits a diverse range of habitats, both tidal and inland, mudflats, salt marshes, beaches, salt fields, temporary floodwaters. Is a very common migrant in areas that are most favoured and scattered elsewhere.	Recorded	Yes	This species was recorded during the pre-wet season survey. This species is not likely to use the Project Area exclusively, especially given the nearest major and favoured feeding area is Roebuck Bay, 600 km north of the Burrup Peninsula.
Calidris subminuta	Long-toed Stint	M, IA	IA	Appears in pairs, singularly or in flocks within favoured sites. Uses shallow fresh water, brackish swamps, lakes with muddy edges. Prefers low vegetation rather than open mudflats. Scarcely seen.	Low	No	This species has been historically recorded on the Burrup (Worley Astron, 2006). It is unlikely that this species would use the open mudflats present in the Project Area.
Calidris tenuirostris	Great Knot	CR, M, IA	CR, IA	Often seen in large flocks of hundreds to thousands of birds. Forages over inter-tidal flats. Will reside in sheltered coastal mudflats of estuaries, lagoons and mangrove swamps. Sometimes uses salt lakes but rarely inland waters.	Low	No	This species has been historically recorded on the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of APM's surveys. The samphire/mudflat habitat is likely too open for this species, and it does not that contain the mangrove swamps it prefers.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Calonectris leucomelas	Streaked Shearwater	M, IA	IA	Frequents pelagic oceans, shelf waters and edges and follows fishing boats. Very rarely inhabits inshore areas.	Low	No	This species was identified as a migrant within the area according to the EPBC PMST. It is not likely to utilise any habitats present in the Project Area.
Chalcites osculans	Black-eared Cuckoo	M	-	Inhabit dry habitats such as open woodland, mulga and mallee, sparse and open arid areas with spinifex, grassland or salt marsh and lines of vegetation along watercourses. Present across most of northern Australia.	Recorded	Yes	A solitary and inconspicuous species. This species breeds in the south east after rain in rain semi-arid regions. This species is a transitory visitor to site. Recorded in Worley Astron 2006 and APM
Charadrius leschenaultii	Greater Sand Plover	VU, M, IA	VU, IA	Resides in large mixed-species flocks on coastal, intertidal mudflats and sandbanks of sheltered bays. Less common on coastal salt marshes and brackish or freshwater wetlands.	Moderate	Yes	This species has been recorded northeast of Rosemary Island on an islet called Lady Nora within the Dampier archipelago and Hearson's Cove. This species is a regular migrant between August and May and is most common in northern Australia. The species is not expected to be reliant on the Project Area habitats given it prefers sheltered bays and intertidal mudflats.
Charadrius mongolus	Lesser Sand Plover	EN, M, IA	EN, IA	Inhabits intertidal sandflats and mudflats, beaches and sandbars and reef flats.	Low	Yes	This species has been historically recorded on Dolphin Island in the Dampier region. This species sometimes overwinters in northern Australia. It is abundant in Queensland, and uncommon elsewhere in Australia. This species is not expected to rely on habitats present in the Project Area, especially as this species does not breed in Australia.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Charadrius ruficapillus	Red-capped Plover	M	-	Inhabits coastal, sheltered estuaries, salt marsh lagoons, and inland areas consisting of salty edges of waterways, brackish pools and claypans. Highest numbers can occur on inland salt lakes.	Recorded	Yes	This species was recorded during the pre-wet and post-wet season surveys. It is one of the most common shorebirds, and it breeds within northern Australia between September and December, where they create nests on beach or beside claypans or salt lakes. This species is not dependent on specific habitat types and is not expected to be impacted locally or regionally by the Project development. No nests were recorded.
Charadrius veredus	Oriental Plover	M, IA	IA	This species prefers samphire vegetation and other sparse grassy flats.	Low	Yes	This species has been recorded in the Dampier region on Enderby Island (DBCA, 2018). Suitable habitat is present in the Project Area, however, it was not recorded on either of the APM surveys.
Chlidonias hybrida	Whiskered Tern	M	-	An inland species that uses inland freshwater or permanent/temporary floodwater, claypans, sometimes estuaries or marine habitat. Occurs in flocks usually when foraging.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM during the post-wet season survey. The presence of this species is dependent on rainfall and flooding of wetlands. The species could utilise the samphire vegetation present in the Project Area for breeding. No evidence of breeding (presence of nests) was identified by APM.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Chlidonias leucopterus	White-winged Black Tern	M, IA	IA	Inhabits marine and freshwater coastal wetlands, including inundated floodplains and estuaries. A regular migrant to Australia, common in the Top End. They congregate in large flocks in preferred sites and at staging sites before northern migration (Alva Beach Queensland and Perron Island Northern Territory). Elsewhere they roost and forage in small flocks or can be seen in twos, threes or singularly (DoEE, 2018).	Moderate	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during the pre-wet season survey. This species could utilise the marshy habitat present within the samphire vegetation and claypans. If present, the species would only likely be in small numbers as the area is not a “staging site”.
Chroicocephalus novaehollandiae	Silver Gull	M	-	Very common and widespread bird. Inhabits diverse habitat-types including beaches, temporary floodwaters, inland rivers etc.	Recorded	Yes	This species was recorded by APM during both surveys. The species is not limited to one habitat type and will not be impacted by the Project development.
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo	M	-	A common bird across all of Australia. Its most commonly frequented habitat types include open forest, woodland and roadside trees.	Low	Yes	This species has been historically recorded on the Burrup (Worley Astron, 2006). Some suitable habitat exists in the Project Area, where the creek lines contain mature Eucalyptus victrix.
Circus approximans	Swamp Harrier	M		Forages over reed beds, open water of swamps and lakes, mangroves, salt marshes and temporary floodwaters. Builds nest within swamp or lake within dense reeds or other wetland plant material.	Low	Yes	This species has been recorded historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded in the Project Area surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Coracina novaehollandiae	Black-faced Cuckoo-shrike	M	-	Inhabits exceptionally diverse habitats from semi-desert scrub to tall, wet forests of the southeast and Tasmania. It is found almost throughout the entirety of Australia.	Recorded	Yes	This species was recorded during both APM surveys. Given the lack of many overstorey trees in the Project Area, aside from scattered Eucalypts, this species is not likely to rely on the area for breeding, though it is possible. The wide diversity of its habitats mean that the species is not limited to select few habitats, especially habitat present in the Project Area, which is widespread elsewhere.
Egretta garzetta	Little Egret	M	-	Inhabits fresh and marine wetlands. Forages in the shallows of swamps, floodplain pools, mudflats and mangrove channels.	Recorded	Yes	This species was recorded by APM during both surveys. It is a common species in northern Australia.
Egretta sacra	Eastern Reef Egret	M	-	Inhabits estuarine mudflats and inshore reefs. Nests in colonies on islands within mangroves or on ground or ledges among shrubs and rocks.	Low	No	This bird has been recorded in the area before according to Worley Astron, in 1994 (Butler) and by CALM in an unpublished report. This species may use the habitat present adjacent the Project Area for feeding (mangrove and King Bay estuary), though if present would be more likely to utilise shorelines containing mangroves.
Esacus magnirostris	Beach Stone-curlew	M	-	Confined to marine tidal zone containing mudflats, mangroves, sandy stony and rocky shores.	Low	No	This species was recorded in 1994 (Worley Astron, 2006). This species is known to be shy and wary and avoids disturbed areas. If it were to occur, it would likely be in the islands that are largely undisturbed and contain mangrove swamps, north of Burrup and far off the coast of Dampier.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Eurostopodus argus	Spotted Nightjar	M	-	Inhabits open, dry country with stony ground and litter of yellow/ochre coloured leaves. Open habitats such as spinifex, mallee, eucalypt, acacia and mulga. Species favours stony ridges.	Moderate	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of APM's surveys. The presence of rocky outcrops and open spinifex grasslands and scattered eucalypts make the Project Area quite suitable for this species.
Falco cenchroides	Nankeen Kestrel	M	-	Inhabits open habitats, woodlands, grasslands, sparse scrub, heath, farms, roadsides and coastal dunes. Common on the mainland.	Recorded	Yes	This species was recorded by APM during both surveys. The species breeds in the north between August and January. This species could use the area given the combination of large open areas for foraging, and tall Eucalyptus trees for nesting.
Falco peregrinus	Peregrine Falcon	-	OS	Very diverse habitat ranging from arid scrub, coastal heath and rainforest. Often hunts over offshore islands and estuaries.	Moderate	Yes	This species has been recorded at Burrup in 2006 and Hearson's Cove (DBCA, 2018). The Project Area could provide foraging habitat, though it would not provide adequate nesting habitat given the lack of undisturbed, tall cliff faces with sheltered ledges.
Fregata ariel	Lesser Frigatebird	M, IA	IA	Flies over shelf waters, open sea, close inshore and inland over continental coasts and perches on trees.	Low	Yes	This species has been recorded in the Dampier region on Cohen island (DBCA, 2018). This species is predominantly aerial and marine. It breeds between May and December and colonies are often found on islands. If it were present in the Project Area, it would be transitory, flying over the area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Gelochelidon nilotica	Gull-Billed Tern	M, IA	IA	Occurs over inland and rarely over ocean. Nests on inland waters both fresh and saline. Uses water on mudflats, claypans, saltpans, salt marsh and areas of shallow flooding. Prefers lagoons and salt marshes near the coast when not breeding, and when breeding uses small islands.	low	Yes	This species has been recorded on Dolphin Island on the Dampier Archipelago (DBCA, 2018). This species may use the Project Area for foraging, though it is unlikely given its preferred habitat is coastal and intertidal areas.
Glareola maldivarum	Oriental Pratincole	M, IA	IA	Inhabits mudflats, beaches and shallow water areas such as margins of wetlands and lakes where large clouds of insects group.	Low	Yes	Dispersive and nomadic, the species ranges widely to locate the most productive sites. Is a temporary visitor to northern Australia. The species is known to rest on flat areas of ground which can be roads, airfields, paddocks and mudflats. Suitable habitat is widespread for this species.
Grallina cyanoleuca	Magpie-lark	M	-	Has diverse range of suitable habitats from coastal to semi-dessert where water and trees occur. This species is well adapted to live in man-made environments, particularly where there is permanent water.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM in 2019. The species is a very common vagrant.
Haliaeetus leucogaster	White-bellied Sea-eagle	OM	-	Perches on high cliffs overlooking coastal and inland waters. Inhabits islands, reefs, bays, estuaries, mangroves, lagoons and floodplains along major rivers.	Recorded	Yes	This species may hunt over the Project Area and surrounds, especially given the proximity of coastline surrounding the area, but would likely focus more on the offshore islands that contain extensive mangroves and pools. APM did record this species on the western side of the Project Area, flying over Burrup Road and the adjacent rocky outcrops.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Haliastur indus	Brahminy Kite	M	-	Along shorelines, shallows, mangroves and mudflats. Prefers coasts with islands, mangroves, estuaries, mud-flats, harbours and coastal towns.	Recorded	Yes	This species was recorded during the pre-wet and post-wet season surveys. This species is known to scavenge for carrion along the shoreline and shallows and is also an opportunist hunting for fish, and reptiles and insects on land. The species likes to build its nests where mangroves meet the sea. The Project Area is not expected to provide ideal breeding habitat, though the species would use the area to forage. Extensive opportunities for feeding are present outside the Project Area.
Haliastur sphenurus	Whistling Kite	M	-	Often flies over wetlands, but also arid regions, open woodland and scrub.	Recorded	Yes	Is primarily an scavenger, locating carrion and roadkill. This species breeds in tall trees within a woodland, near or standing in water, creek or dam. The Project Area is likely to provide some suitable breeding and foraging habitat, given the presence of some tall Eucalypt woodlands in gullies, and the addition of roads and paths within and nearby the site, that the species could feed within. No nests were located.
Himantopus himantopus	Australian Pied Stilt	M	-	Inhabits shallow wetlands, interior claypans and salt lakes. Widespread and common. Breeds after substantial rain. The species builds a small platform nest of plant material within shallows of islet or beach.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM during the post-wet season survey. No nests were located in the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Hirundo neoxena	Welcome Swallow	M	-	Typically occupy open habitats of woodland, grassland, wetland and farmland. Has adapted well to developed areas, and often utilises artificial habitats such as buildings and bridges that can offer sheltered sites for building mud nest. Nests can be made in mine shafts and under culverts as well. When not available, they use underside of cliffs and inside of large tree hollows.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM in 2019. This species could utilise the Project Area given the availability of nesting spots and foraging areas. It is a common vagrant species.
Hirundo nigricans	Tree Martin	M	-	Occupies open woodland and farmland containing trees not far from water. Uses small hollows in upper limbs of tall trees. Nomadic or migratory over most of its range and is common.	Recorded	Yes	This species has been recorded in 1994, 1995 and 2001 (Worley Astron, 2006), and more recently by APM during the post-wet season survey. The species would only use the area during the wet season when the gullies and channels within the Eucalyptus woodland are full of water.
Hirundo rustica	Barn Swallow	M, IA	IA	Visits northern Australia from September to March, in close proximity to towns and wetlands including salt ponds and swamps.	Moderate	Yes	This species may utilise artificial water bodies at the Project Area and natural areas containing the mudflats and clay pans.
Hydroprogne caspia	Caspian Tern	M, IA	IA	The species flies over the surf line and inshore waters. The species prefers sheltered estuaries, inlets, bays, harbours, lagoons with muddy or sandy shores. Will also utilise fresh and saltwater lakes and large rivers.	Recorded	Yes	This species has been recorded on Keast Island in the Dampier Archipelago (DBCA, 2018) and more recently by APM during the post-wet season survey. The species would be more inclined to use the undisturbed islets and islands off the archipelago and the individual recorded by APM was likely only an opportunistic visitor.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Hypotaenidia philippensis	Buff-banded Rail	M	-	Feeds at dawn before full sunlight and at dusk, on exposed mudflats and open marshy ground. Resides within damp and dense vegetation around swamps, lakes and tidal mudflats. Dense vegetation is required for nesting, though can be far away from water, but usually not.	Low	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of the APM surveys. This species could use the samphire vegetation and possibly the more-swampy areas after rain throughout the Project Area, however the vegetation is likely too sparse to provide adequate nesting habitat.
Limicola falcinellus	Broad-billed Sandpiper	M, IA	IA	Prefers sheltered coastal estuaries and soft inter-tidal mudflats, coastal creeks, swamps and sewage ponds and only occasionally reefs. Often seen with Red-necked Stints or Curlew Sandpipers. A migrant to Australia, during non-breeding season. They mostly occur on the Pilbara and Kimberley coasts between Onslow and Broome (DoEE, 2018).	Moderate	Yes	The largest population of these birds is seen at the Port Hedland Saltworks (around 6000 birds). Suitable habitat for this species does occur adjacent the Project Area, though is not expected to be impacted.
Limosa lapponica baueri	Bar-tailed Godwit	VU, M, IA	VU	This species forages over coastal dunes. Has been observed amongst sand and mud flats in estuarine and beach areas, as well as near-coastal salt ponds and salt lakes.	Moderate	Yes	This species has been recorded in the Dampier region on Dolphin Island and Hearson's Cove (DBCA, 2018). This species may forage over the salt ponds and mud flats present in the Project Area.
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CR, M, IA	CR	This species forages over coastal dunes. Has been observed amongst sand and mud flats in estuarine and beach areas, as well as near-coastal salt ponds and salt lakes.	Low	Yes	This species is present in the north and south of Western Australia. This species may forage over the salt ponds and mud flats present in the Project Area.
Limosa limosa	Black-tailed Godwit	M, IA	IA	Inhabits coastal areas such as sheltered bays, islets containing large inland lakes, tidal mudflats and sandbars.	Low	Yes	This species has been recorded in the Dampier region (DBCA, 2018), however it is most abundant on the east coast of Darwin.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Macronectes giganteus	Southern Giant-Petrel	EN, MM[3]	MM	Occupies marine habitats, over open seas and inshore waters. It favours the edges of the continental shelf. Gathers in areas of carrion and sewage for foraging.	Low	No	This species is far more common in the southern parts of Australia. This species would be a transitory visitor flying over site, if present at all.
Merops ornatus	Rainbow Bee-eater	M	-	Common and widespread, this species likes open woodland, open forest, semi-arid scrub, grassland, clearings in heavier forest and farmland. The emphasis is on open areas, as the species pursues insects in the air.	Recorded	Yes	This species was recorded during the pre-wet season survey. The species breeds before and after the Wet season. It digs long and narrow tunnels in soft, loamy soil of flat ground or banks that extends to a wide chamber where it nests. The species is likely to use the area for foraging and breeding within the mangrove, clay pans/salt lakes and creeklines. However, beach and dune systems adjacent and outside the Project Area could also provide suitable foraging and breeding habitat and the mangrove habitat is outside the development area.
Motacilla cinerea	Grey Wagtail	M, IA	IA	If seen in Australia, will inhabit fresh streams, mown grass, ploughed land or sewage ponds.	Low	No	This species rarely reaches Australia during its winter migration south of the equator.
Motacilla flava	Yellow Wagtail	M, IA	IA	Visitor between May and September in Australia, but uncommon in the northern Pilbara. Inhabits fresh streams, mown grass, ploughed land or sewage ponds.	Low	No	Uncommon and vagrant visitor to northwest Australia.
Ninox novaeseelandiae	Southern Boobook	M	-	Inhabits anywhere containing open eucalypt forest and woodland. Preys on insects and arthropods, small birds and rodents (and similar sized mammals). Roosts in dense foliage during the day. Requires either tree hollows or old babbler nests or hollowed out cliff for nesting.	Low	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during the pre-wet season survey. The vegetation is likely too sparse for this species to roost, though areas suitable for foraging are present.

[3] Listed as a Marine Migratory (of Australia only and not under International Agreement) under the *EPBC Act* 1999.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Numenius madagascariensis	Eastern Curlew	CR, M, IA	CR, IA	Predominately found in estuarine systems, saltmarshes, tidal mudflats and mangroves. Can be found in brackish or freshwater lakes.	Moderate	Yes	This species has been recorded at Nickol Bay (east coast of Burrup) (DBCA, 2018). This species is a common migrant to the north, northeast and southeast of Australia.
Numenius minutus	Little Curlew	M, IA	IA	This bird flocks in large numbers across extensive swamps and billabongs of the coastal black-soil plains of northern Australia. Inhabits dry grassland of clay and black soil plains, river floodplains, woodlands with a grassy understorey. Forages on recently burnt grassland or open woodland. These birds also like artificial habitat such as grassed fields and lawns, airfields/ aerodromes and pasture.	Low	Yes	This species has been recorded at the Hampton Oval sports complex in Dampier (DBCA, 2018). This species is abundant along the northern coastlines of Australia. As it is commonly recorded on open cleared fields in developed areas, it is unlikely this species would rely on the Project Area habitats.
Numenius phaeopus	Whimbrel	M, IA	IA	Inhabits mudflats of estuaries, lagoons containing mangroves. Less often in sandy beaches, reefs and salt lakes.	Recorded	Yes	This species has been recorded on Dolphin Island in Dampier, King Bay and Cowrie Cove within the Burrup Peninsula (DBCA, 2018) and more recently by APM during the post-wet season survey. This species would be an opportunist during the wet season and not likely to rely on suitable habitat in the Project Area.
Nycticorax caledonicus	Nankeen Night Heron	M	-	Secluded wetlands; flooded grassland, damp fields, mangroves, tidal channels. Prefers sites that contain some dense tree cover for protection when roosting.	Low	Yes	This species has been recorded historically recorded within the Burrup Peninsula (Worley Astron, 2006). The species breeds in the late Wet season (Feb- Apr). The Project Area does not contain the mangroves, and much dense vegetation that the species likes for protection.
Oceanites oceanicus	Wilson's Storm Petrel	M, IA	IA	Inhabits deep pelagic seas, shelf slopes and shallower shelf and inshore waters. Records are usually from edge of continental shelf.	Low	No	This species is widespread and abundant. It has been historically recorded on the Burrup (Worley Astron, 2006). It is not expected to use habitats present in the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Onychoprion aneathetus	Bridled Tern	M, IA	IA	Inhabits areas often far from land, forages on open seas and frequents islands and reefs to breed, sometimes inshore waters.	Low	No	This species has been recorded on Quartermaine Island in the Dampier Archipelago (DBCA, 2018). This species would be unlikely to use any waters present in the Project Area.
Pandion cristatus	Eastern Osprey	M, IA	IA	Inhabits coastal waters and estuaries, islets and exposed reefs. The species follows major rivers inland and even to large pools and gorges in arid regions. More common across northern coasts along rocky shorelines, islands and reefs.	Recorded	Yes	This species has been recorded on Roly Rock islet in Dampier (DBCA, 2018) and more recently by APM during the post-wet season survey. The species would be a transitory visitor, foraging or flying over site and would be more inclined to forage over the vast undisturbed rocky islets and islands across the Dampier archipelago, north and northwest of the Burrup.
Pelecanus conspicillatus	Australian Pelican	M	-	Wide distribution and much available habitat; any large or small area of water from sheltered coastal bays and estuaries to temporary pools in the desert.	Moderate	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of the APM surveys.
Pezoporus occidentalis	Night Parrot	EN	CR	Thought to be associated with spinifex or samphire bushes on the margins of salt lakes. It nests in the dense clumps of spinifex.	Low	Yes	This species is exceptionally rare and in low numbers. This species is known to inhabit inland very arid areas.
Phalaropus lobatus	Red-necked Phalarope	M, IA	IA	Frequents seas that are rich in plankton but does occasionally blow inshore to shelter from gales on coastal wetlands. It infrequently comes to land. Feeds on sea surface. The species has been observed on brackish, saline or fresh water pools and muddy margins. The species is considered a rare vagrant and is present at sea during the nonbreeding season.	Low	Yes	The species is a seasonal or occasional visitor of the Burrup Peninsula (Worley Astron, 2006). It was not recorded on either of the APM surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Pluvialis fulva	Pacific Golden Plover	M, IA	IA	Occupies coastal habitats in small flocks or large flocks within estuaries, intertidal mudflats, salt marshes. reefs and offshore islands. The species disperses around suitable habitat areas on the coast.	Recorded	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018) and more recently by APM during the post-wet season survey. The species would be more inclined to inhabit the islands on the west side of Dampier and Burrup, where suitable habitat is vastly available, and especially where it is quieter, as the species is quite shy and wary. Only one individual was recorded by APM.
Pluvialis squatarola	Grey Plover	M, IA	IA	Inhabits coastal areas, marine shores of estuaries or lagoons, on broad open mudflats, sandbars, beaches, rock platforms, reef flats of rocky coasts. Also forages slightly inland near coast and on the margins of salt lakes or swamps.	Low	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018). Sometimes seen with Golden Plovers. This species is shy and tends to stay out far on shallows or flats. This species would likely inhabit the offshore islands and islets away from human development and where suitable habitat is abundant.
Recurvirostra novaehollandiae	Red-necked Avocet	M		Uses salt and freshwater wetlands. Large numbers reside on shallow salt lakes, especially as salinity rises during evaporation. They inhabit claypans and temporary flood waters. Breed after good rain.	Moderate	Yes	This species has been historically recorded within Burrup (Worley Astron, 2006). It was not recorded during either of APM's surveys.
Rostratula australis	Australian Painted-snipe	EN	EN	Resides within the dense vegetation of swamps, emerging during light of dawn and dusk. It prefers the surrounds of shallow wetlands that are well vegetated with dense low cover, typically swamps and flooded areas containing sedges and grasses. Breeds in inland southeast Australia amongst low samphire bushes.	Low	Yes	This species is very secretive and often not seen and therefore it is not well known. It is uncommon generally. Though the Project Area does contain large mudflat and clay pans with samphire, the majority of breeding records are from freshwater wetlands. It is not likely the area would provide preferred habitat, or that the species occurs in the area at all.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Sterna dougallii	Roseate Tern	M, IA	IA	Inhabits marine, coastal and often coral reefs, foraging over reefs, lagoons and surrounds. Usually avoids mainland shoreline but may use shallow water just offshore (100 m).	Low	No	This species has been recorded on Goodwyn island in the Dampier archipelago (DBCA, 201). This species would be unlikely to use the habitats within the Project Area, possibly only the shoreline within Hearsons cove.
Sterna hirundo	Common Tern	M, IA	IA	Inhabits marine environments, well offshore, sometimes coastal waters, bays, estuaries and ocean beaches. A moderately common species (*longipennis* race) in the north.	Low	No	This species has been recorded on Eaglehawk Island on the Dampier archipelago (DBCA, 2018). This species would be more inclined to use offshore islets and islands of the archipelago.
Sternula albifrons	Little Tern	M, IA	IA	Resides within shallow coastal waters such as estuaries, lagoons and channels around rivers and harbours. Often congregates within favoured islets.	Low	Yes	This species has been recorded on Enderby island on the Dampier archipelago (DBCA, 2018). May use harbours adjacent of Burrup, on the west side and river channels during the Wet season present in the Project Area.
Sternula nereis nereis	Australian Fairy Tern	VU	VU	Habitat includes sheltered coasts, bays, inlets, estuaries, coastal lagoons, ocean beaches and also inland salt ponds and lakes and wetlands near the coast. However, it favours sand spits of islets in river-mouth channels, where they can forage on the seaward side of reefs and islands.	Low	Yes	This species has been recorded on Egret Island on the Dampier archipelago (DBCA, 2018). This species would be more inclined to use the sheltered and undisturbed bays within the islands and islets of the archipelago.
Stiltia isabella	Australian Pratincole	M	-	Forages for insects and small prey within sparse wooded plains and grasslands, claypans and stony ground. Does not venture far from water. Breeds after rain and within stony ground.	Low	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of APM's surveys. Suitable foraging and breeding habitat exist for this species, though its occurrence is unpredictable.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Sula leucogaster	Brown Booby	M, IA	-	Inhabits marine environs where it travels low over waves to forage in deep waters but also inshore shallows.	Low	No	This species has been recorded on Cohen Island on the Dampier Archipelago (DBCA, 2018). This species would use the offshore islands of the archipelago where foraging opportunity is high.
Thalasseus bengalensis	Lesser Crested Tern	M	-	Inhabits sandy beaches, coral cays, exposed reefs, islands and mudflats, estuaries and creek channels. Breeds in the northeast and northwest on offshore islands. Known to breed on Adele and Bedout islands.	Recorded	Yes	This species was recorded by APM during pre-wet season survey. The species is utilising mudflats and creeks present in the Project Area for foraging, though given the known breeding habitat is islands and rocky shorelines, the species may be more inclined to use undisturbed rocky islets present across the archipelago. APM recorded just one individual during dry conditions.
Thalasseus bergii	Crested Tern	M, IA	IA	This species is a common tern, especially of bays, harbours, boats and jetties. Inhabits beaches, offshore islands, deeper pelagic seas, inshore estuaries and only occasionally on salt ponds and saline lakes near the coast.	Moderate	Yes	This species has been recorded on the Dampier Archipelago and Hearson's Cove (DBCA, 2018). This species may utilise the Project Area for foraging over the salt clay pans during the wet season.
Todiramphus sanctus	Sacred Kingfisher	M	-	Occupies semi-arid scrubland, open forest, woodland and mangroves. Hunts on dry land for small reptiles and large insects. Sometimes uses wetlands.	Moderate	Yes	This species has been recorded in 1994, 1998 and 2004 (Worley Astron, 2006). Suitable habitat exists for this species though it has a wide known range.
Tringa brevipes	Grey-tailed Tattler	M, IA	IA	Coastal habitats including inter-tidal pools, shallows, soft surfaces of mudflats and sand beaches, but also rocky ledges and reefs.	Recorded	Yes	This species has been recorded on Roly Rock islet in the Dampier archipelago (DBCA, 2018) and more recently by APM during the post-wet season survey. This species utilises the mudflats present in the Project Area for foraging. Suitable habitat is vast outside of the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Tringa glareola	Wood Sandpiper	M, IA	IA	Resides within shallows of wooded lakes or swamps with trees where it forages among fallen trees and vegetation, only occasionally frequents mangroves and brackish waters.	Low	Yes	This species has been recorded on Roly Rock islet in the Dampier archipelago (DBCA, 2018). This species is an uncommon migrant. May possibly utilise the Eucalypt woodlands during the wet season when the channels have filled with water.
Tringa nebularia	Common Greenshank	M, IA	IA	This species requires open swamps, and therefore may only use smaller water bodies opportunistically. However, records have been made in dams and sewage ponds. Typically associated with saltmarshes, estuaries and shallow waters such as clay pans and mudflats, it prefers wet and flooded mud and clay, rather than sandy ground.	Recorded	Yes	This species has been recorded on Roly Rock islet within Dampier and King Bay (DBCA, 2018) and more recently by APM during the post-wet season survey. This species diverse habitat usage means that it is likely to not be reliant on habitats present in the Project Area.
Tringa stagnatilis	Marsh Sandpiper	M, IA	IA	Inhabits coastal and inland wetlands, beaches, mangrove mudflats, shallows of swamps, temporary flood waters and salt ponds.	Low	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018). While this species is more common in the far northern parts of Australia, suitable marshy habitat is present in the Dampier region and the Project Area.
Tringa totanus	Common Redshank	M, IA	IA	Frequents coastal wetlands inclusive of estuaries and lagoons that contain sandbars, mudflats and saltlakes. Uncommon visitor but is known to be a regular summer visitor in some sites around the coast.	Low	Yes	One occurrence of this species has been recorded within AoLA records, from 1994, on the expansive intertidal flats of Nickol Bay.
Xenus cinereus	Terek Sandpiper	M, IA	IA	Resides in coastal mudflats, sheltered estuaries, lagoons and sandbars, reefs, coastal swamps and salt fields.	Low	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018). Common in the northern coasts of Australia and is concentrated (among other areas) in the area between Eighty Mile Beach and Broome.
Mammals							

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Dasyurus hallucatus	Northern Quoll	EN	EN	Inhabits rocky outcrops and mezzo-formations in areas with Eucalyptus woodlands.	Moderate	Yes	This species has been previously recorded on Dolphin Island in the Dampier region and on the Burrup Peninsula in various locations, including a sighting at the port area of King Bay warehouse.
Hydromys chrysogaster	Water-rat, Rakali	-	P4	Occurs in habitats with fresh, brackish or marine water. They require a permanent water source all year round. In the Pilbara, the species occurs along the coastline and offshore islands where they forage for a diverse range of aquatic and terrestrial creatures.	Low	No	This species has been recorded on the Burrup Peninsula (DBCA, 2018). If the species were present in the area, it would be most inclined to use the coastline of bays, most likely further north into Dolphin and Legendre Islands, and other islands further offshore in the archipelago where it is undisturbed and more vegetated than rocky.
Macroderma gigas	Ghost Bat	VU	VU	Inhabits arid spinifex hillsides, open savannah woodland, tall open forest etc. They roost in sandstone or limestone caves or under boulder piles and abandoned mines. They prefer to roost deep in the cave system and in a relatively open space in the cavity. This has to do with humidity and temperature in the microclimate that caves produce. Females roost with young preferentially in the large open cavity far from the cave entrance.	Recorded	Yes	This species has been recorded on the Burrup Peninsula about 4 km northeast of the Project Area (DBCA, 2018) and more recently by APM during the post-wet season survey. This species was once distributed over the entire north of Australia but is now restricted to pockets within tropical areas. This is partly due to the introduction of the Cane Toad, but also loss and disturbance of roost sites and loss of foraging habitat through inappropriate management and dramatic land-use change (DENR, 2016).
Macrotis lagotis	Greater Bilby	VU	VU	The former range of the Greater Bilby has declined dramatically, and the remaining populations of the Bilby reside within three main habitats; the open tussock grassland on uplands and hills, mulga woodland on ridges and rises and hummock grassland in plains and alluvial areas (DoE, 2016).	Low	Yes	The species is highly unlikely to occur in the Project Area due to the lack of appropriate burrowing substrate, and the presence of foxes.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Ozimops cobourgianus	Northern Coastal Free-tailed Bat	-	P1	Uses mangroves to roost, particularly crevices in dead upper branches of *Avicennia marina*. They are restricted to mangrove forests adjacent monsoon forest along large waterways and vine thickets. They like unobstructed corridors in the form of roads or creeklines when foraging for flying insects.	Recorded	Yes	This species has been recorded in the Burrup Peninsula and the Cowrie Cove (a bay just north of Hearson's Cove) in the mangrove habitat. Suitable habitat exists adjacent the Project Area but also is extensive elsewhere (mangroves) along the Burrup and its islands. This bat was recorded during both APM seasonal surveys, across multiple sites, indicating the Project Area is of suitable foraging habitat.
Petrogale lateralis lateralis	Black-footed Rock-Wallaby	EN	EN	This species was historically widespread, though is now only patchily distributed in protected parts of WA including Barrow Island and Cape Range National Park in the Pilbara (DPaW, 2013). The species no longer occurs within the Burrup and Dampier Peninsulas. This rock-wallaby shelters in deep rocky caves, cliffs, screes and rockpiles. They emerge at dusk to feed on grasses and shrubs not far from their shelter site, if food is available.	Low	Yes	The Black-footed Rock-wallaby (Petrogale lateralis lateralis) was recorded on the Burrup Peninsula in 1994 (Worley Astron, 2006; see Appendix B for a list of fauna), however it is not expected to currently occur on the Burrup Peninsula.
Pseudomys chapmani	Western Pebble-mound Mouse	-	P4	This species builds relatively high (up to 10 cm and more) mounds out of tiny pebbles found on the ground. They create intricate chambers underground at least 60 cm deep where they escape the heat of the day. They do continue to use their durable mound systems throughout generations (Anstee *et al.* 1997). The mouse forages in dry creek beds and mounds are usually created amongst hummock grassland of sandy and pebbly soils.	Low	Yes	This species has been historically recorded in the Burrup Peninsula within the Murajuga National Park (DBCA, 2018). The species has declined in its range, particularly along the Pilbara coasts, likely due to predation by foxes, though populations are still present in the Pilbara and Sandy Desert. The Project Area lies within the former extent of occurrence for the species, though suitable habitat is present within the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Rhinonicteris aurantia	Pilbara Leaf-Nosed Bat	VU	VU	Inhabits tall open forest, open savannah woodland and spinifex-covered hills etc. Their roost cave requirements are very specific, requiring about 100% humidity and a very high temperature.	Low	Yes	This species may use the rocky outcrops that contain woodland creek lines running through, that may support cave systems deep enough to offer suitable microclimate conditions in both the dry and wet-seasons, though these caves are quite uncommon. The bat would be more likely to use the area for foraging, and potentially use shallower caves provided by the outcrops as a temporary refuge in the wet-season as they can forage several kilometres from their day-time roost sites. The species is predated quite heavily by Ghost Bats.
Ctenotus angusticeps	Northwestern Coastal Ctenotus	VU	P3	Inhabits salt marsh communities in samphire shrubland. Records exist in samphire sites close to tidal creeks. Strongly associated with *Tectornia halocnemoides* subsp. tenuis *and Suaeda arbusculoides* occurring on clayey soils and mixed herb and grass cover of *Sporobolus virginicus* and *Muellerolimon salicorniaceum*. The species appears to utilise crabholes for shelter and protection.	Low	Yes	Suitable habitat does exist for this species within the Project Area, though it is not known from the Burrup region. Biologic (2013) recorded the species 7 km East of Karratha at Lulu Creek in 2012. The species is threatened by Buffel Grass (*Cenchrus ciliaris*) which is present within the Project Area.
Reptiles							
Liasis olivaceus barroni	Olive Python	VU	VU	Occurs in a range of habitats from savannah woodlands to monsoonal forests. Typically, in areas of rocky hills, outcrops and ranges.	High	Yes	This species has been historically recorded on Dolphin Island in the Dampier region and in King Bay, Hearson's Cove and in many locations around the Karratha Gas Plant and Pluto LNG facility, particularly where artificial water sources occur(open water pit) It is often recorded around the built environment and highly disturbed areas. APM did not record the species on either of the surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
Notoscincus butleri	Lined-soil Crevice Skink (Dampier)	-	P4	Inhabits stony areas dominated by spinifex ground cover. Was originally only known from the Dampier Archipelago region of WA, but records from early 2000 have since increased the known range of the species.	Moderate	Yes	Historical record of the species within the Burrup Peninsula made by Biota in 2001 (Worley Astron, 2006) and other records exist on West Intercourse Island and several on the mainland extending into Millstream Chichester National Park, Pannawonica and west of Mount Sheila. It is possible this species may occur in the Project Area, given its preferred habitat however, targeted trapping and search effort would be required to eliminate uncertainty of the presence of this species.

APPENDIX I: SPECIES BY SITE MATRIX

Family	species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
AIZOACEAE	*Trianthema turgidifolia*					0.1	0.1	20	1.0	0.1																					0.1				2					
	Trianthema triquetrum		0.1																																					
AMARANTHACEAE	**Aerva javanica*						0.1	0.1	50							0.1					0.1								20		0.1						0.1	
	Amaranthus undulatus																																							
	Gomphrena leptoclada subsp. leptoclada		0.1			0.1						1		2									5										0.1	0.1			0.1			
	Ptilotus exaltatus														1						0.1				1					0.1	0.1								
	Ptilotus fusiformis											0.1	0.1																											
APOCYNACEAE	*Cynanchum floribundum*	0.1	0.1																																					
ARALIACEAE	*Trachymene oleracea* subsp. *oleracea*	0.1	0.1		0.1	1	0.1						0.1	1.0				0.1	0.1		0.1					0.1								1			0.2		0.1	0.1
ASTERACEAE	*Pentalepis trichodesmoides*																																							
	Pterocaulon sphaeranthoides	0.1			0.1	1	0.1						0.1																0.1											
	Streptoglossa decurrens		0.1																																					
BIGNONIACEAE	*Dolichandrone occidentalis*																																							1
	Ehretia saligna var. *saligna*				0.1							1																												
BORAGINACEAE	*Heliotropium cunninghamii*					0.1																																		
	Heliotropium tenuifolium																																							
	Trichodesma zeylanicum var. zeylanicum	0.1	0.1	0.1		0.1				0.1		0.1	0.1	0.1												0.1			0.1		0.1		0.1	0.1	0.1			0.1	0.1
CHENOPODIACEAE	*Atriplex codonocarpa*							0.1																																
	Dysphania sp.		0.1																																					
	Enchylaena tomentosa var. *tomentosa*			0.1	0.1																	1		0.1			0.1						0.1		0.1					
	Neobassia astrocarpa							0.1	1																											1					
	Rhagodia eremaea	0.1		2	0.1								0.1	0.1		1	0.1		0.1	3	0.1												0.1				0.1			
	Salsola australis														0.1														0.1											
	Tecticornia auriculata																																							
	Tecticornia halocnemoides							20	1																															
	Tecticornia indica subsp. *indica*							1.0									0.1																			1.0					
	Threlkeldia diffusa																				0.2									0.1										
CLEOMACEAE	*Cleome viscosa*	0.1	0.1			0.1					1.0	1.0	0.1	0.1								0.1				0.1			0.1		0.1			0.1				0.1
COMBRETACEAE	*Terminalia circumalata*																0.1		40																				
	Terminalia supranitifolia (P3)										20	1.0		10																										
COMMELINACEAE	*Commelina ensifolia*																																							
CONVOLVULACEAE	*?Bonamia erecta*																	0.1			0.1																			
	Bonamia pilbarensis																																					0.1		
	Evolvulus alsinoides var. *villosicalyx*														0.1	0.1			0.1		0.1																			

Family	species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	Ipomoea costata			0.1							1	1.0		1.0								1.0				0.1	0.1							0.1							
CUCURBITACEAE	*Cucumis variabilis*	0.1		10	0.1	0.1					1			0.1	0.1				0.1		0.1					0.1			0.1						0.1					0.1
CYPERACEAE	*Cyperus vaginatus*																0.1		0.1				0.1	0.1																
	Cyperus blakeanus																																							
EUPHORBIACEAE	*Adriana tomentosa* var. *tomentosa*																							0.1																
	Euphorbia coghlanii									0.1											0.1									0.1	0.1									
	Euphorbia tannensis subsp. *eremophila*														0.1				0.1		0.1																		0.1	
FABACEAE	*Acacia ampliceps*										1.0												10	0.1											2	40				
	Acacia ancistrocarpa																																							
	Acacia bivenosa	1	1		1.0	25	20			50			0.1		15	0.1	1	1		0.1	0.1	1		0.1		1			1		1	40	0.1		40		0.1	1	1	1
	Acacia colei var. *colei*	0.1											0.1							0.1						0.1						0.1						1	
	Acacia coriacea subsp. pendens	1		1	0.1	0.1		0.1		0.1	0.1	5		1			1		1	1		1	0.1	0.1		0.1					0.1	0.1	0.1		0.1		0.1		0.1	
	Acacia inaequilatera				0.1																								1											
	Acacia pyrifolia												1			1	0.1	0.1			0.1											0.1	0.1	1						
	Acacia synchronicia																																							
	Acacia trachycarpa																																							
	Crotalaria medicaginea var. *neglecta*																														0.1									
	Crotalaria novae hollandiae subsp. novae hollandiae	0.1																																						0.1
	Cullen badocanum																									0.1														
	Dichrostachys spicata		0.1		0.1	0.1					1		0.1	5			1.0	0.1	0.1	0.1	0.1	0.1									0.1	0.1	0.1	0.1	0.1				0.1	
	Erythrina vespertilio																									0.1														
	Indigofera monophylla	0.1	0.1		0.1	2	1						0.1		0.1	0.1		0.1			1								0.1		0.1	0.1		0.1			0.1	0.1	1	0.1
	Indigofera colutea											0.1																												
	Indigofera trita																																							
	Rhynchosia bungarensis (P4)																																							
	Rhynchosia minima	0.1	0.1	0.1	0.1	0.5	0.1				1.0			0.1													2			0.2					0.1			0.1	0.1	0.1
	Senna artemisioides subsp. oligophylla																																							
	Senna glutinosa subsp. *glutinosa*				0.1	0.1									1		0.1			0.1	0.1																0.1			
	Sesbania cannabina															0.1																			0.1	1				
	Swainsona formosa															0.1					0.1																			
	Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)				1																								0.1											
	Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)						0.1																																	0.1

Family	species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	Tephrosia supina											0.1																										0.1		
GOODENIACEAE	*Goodenia microptera*														0.1																0.1									
	Goodenia lamprosperma																																							
	Scaevola cunninghamii																													0.1										
	Scaevola spinescens				1									0.1	0.1						0.1				1		0.1				0.1		0.1							
LAMIACEAE	*lanceolatum*	0.1			0.1	0.1				0.1		1	0.1	15		0.1	0.1			0.1													1.0	0.1						
LAURACEAE	*Cassytha filiformis*	0.1				0.1	0.1										1						1						0.1	0.1	0.1								
MALVACEAE	**Malvastrum americanum*																				0.1																		
	Abutilon fraseri																																							
	Abutilon lepidum	0.1	0.1		0.1		0.1					0.1		0.1																										
	Brachychiton acuminatus			5							20	20		1.0		0.1				0.1		1			1													0.1	
	Corchorus incanus subsp. incanus	0.1																																						
	Corchorus incanus subsp. incanus									0.1			0.1		1.0	2		0.1	0.1		1								0.1		0.1	0.1	0.1	0.1	0.1		1	0.1	0.1	
	Corchorus walcottii																																							
	Gossypium australe														0.1						0.1																		0.1	
	Hibiscus sturtii var. campochlamys					0.1	0.1					0.1	0.1		0.1																							0.1		0.1
	Lawrencia viridigrisea																																							
	Melhania oblongifolia																			0.3																				
	Sida fibulifera																												0.1									0.1		
	Triumfetta appendiculata											0.1		0.1	0.1	1		0.1	0.1		0.1					0.1			0.1		0.1	0.1	0.1				10		0.1	
	Waltheria indica												0.1		0.1		0.1																							
MENISPERMACEAE	*Tinospora smilacina*			1	0.1							0.1													0.1		0.1												
	Tinospora smilacina			1							1.0																												0.1	
MOLUGINACEAE	*Trigastrotheca molluginea*																																	0.1						
MORACEAE	*Ficus brachypoda*																					1.0					1													
MYRTACEAE	*Corymbia hamersleyana*				25								5		0.1	1.0					25										0.1	50				25		25	
	Eucalyptus victrix																10		1.0	60			80	50																
NYCTAGINACEAE	*Boerhavia gardneri*	0.1		0.1	0.1							0.1			0.1																								0.1	
OLEACEAE	*Jasminum didymum* subsp. *lineare*	0.1												1						1.0	1.0						0.1					0.1				0.1			
PASSIFLORACEAE	**Passiflora foetida* var. *foetida*																						80	1.0																
PHYLLANTHACEAE	*Flueggea virosa* subsp. *melanthesoides*													2					0.1																0.1		0.1			
	Notoleptopus decaisnei									0.1																					0.1							0.1		
	Phyllanthus maderaspatensis																																							
PITTOSPORACEAE	*Pittosporum phillyreoides*														0.1		0.1			5	0.1												1				0.1			

Family	species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
PLANTAGINACEAE	*Stemodia grossa*				1	0.1									0.1	0.1					1.0		0.1	0.1										0.1	0.1	0.1	0.1			
POACEAE	**Cenchrus ciliaris*		0.1		0.1	1	0.1	15		10	2	60	0.1	30	0.1	1	0.1	1	0.1	1			10	1						1	0.1	30	20		30	1.0	20	40	1	
	Chrysopogon fallax														0.1						0.1																			
	Cymbopogon ambiguus	0.1			0.1	0.1						0.1		0.1			1.0		0.1			2			1	0.1		10					20				0.1			
	Dactyloctenium radulans																																							
	Eragrostis falcata																																							
	Eriachne helmsii						0.1																																	
	Eriachne mucronata																													15				0.1		80				
	Eriachne obtusa					0.1	0.1																																	
	Eriachne tenuiculmis																1		30														5							
	Paspalidium tabulatum																																							
	Paspalidium clementii														0.1						0.1																			
	Sporobolus virginicus								40																															
	Themeda triandra											0.1	0.1	0.1																	0.1		0.1							
	Triodia ? basedowii (sterile)																																	10						
	Triodia angusta						60								0.1		30	40					50	80							85									1
	Triodia epactia	40	60	40	50	30	20		1	40		20	30	30	10	40	30	20	40	40	15	40			25	90	70			15	1	15	15	75					30	85
	Triodia wiseana																												85										
PROTEACEAE	*Grevillea pyramidalis subsp. pyramidalis*	0.1	1		1					0.1					5	10					1					0.1	0.1		1				0.1	0.1			1			1
	Hakea lorea subsp. *lorea*	1				0.1									0.1			0.1			1					1														
SAPINDACEAE	*Alectryon oleifolius* subsp. *oleifolius*																0.1			3							0.1													
SOLANACEAE	*Solanum diversiflorum*															0.1					0.1																			
	Solanum horridum	0.1			0.1	0.1	0.1			0.1			0.1		0.1	0.1					0.1				0.1	0.1			0.1		0.1		0.1				0.1		0.1	
	Solanum lasiophyllum		0.1							0.1										0.1																			0.1
	Solanum phlomoides																																							
VIOLACEAE	*Hybanthus aurantiacus*	0.1				0.1							0.1																				0.1							
ZYGOPHYLLACEAE	*Tribulus hirsutus*						0.1							0.1	0.1																					0.1				

Family	species	40	41	54	42	43	44	45	46	47	48	49	50	51	52	53	55	56	57	58	59	OC
AIZOACEAE	*Trianthema turgidifolia*				10		0.1		0.1	1	1					5		20				
	Trianthema triquetrum																					
AMARANTHACEAE	**Aerva javanica*								20	3	30							20				Y
	Amaranthus undulatus		0.1																			
	Gomphrena leptoclada subsp. leptoclada		0.1																	0.1		
	Ptilotus exaltatus	0.1																				
	Ptilotus fusiformis											0.1								0.1		
APOCYNACEAE	*Cynanchum floribundum*																					
ARALIACEAE	*Trachymene oleracea* subsp. *oleracea*		0.1	0.1									0.1						0.1	0.1		
ASTERACEAE	*Pentalepis trichodesmoides*																					Y
	Pterocaulon sphaeranthoides									0.1												
	Streptoglossa decurrens	0.1								0.1												Y
BIGNONIACEAE	*Dolichandrone occidentalis*											10										
	Ehretia saligna var. *saligna*																					
BORAGINACEAE	*Heliotropium cunninghamii*																					
	Heliotropium tenuifolium	0.1																				
	Trichodesma zeylanicum var. zeylanicum	0.1										0.1	1						0.1			
CHENOPODIACEAE	*Atriplex codonocarpa*																					
	Dysphania sp.																					
	Enchylaena tomentosa var. *tomentosa*												0.1									
	Neobassia astrocarpa				1				0.1							0.1						
	Rhagodia eremaea												0.1									
	Salsola australis								20		1.0											
	Tecticornia auriculata				25		0.1									20						
	Tecticornia halocnemoides				20	20	15	10								30						
	Tecticornia indica subsp. *indica*																					
	Threlkeldia diffusa								0.1													
CLEOMACEAE	*Cleome viscosa*		0.1	0.1					0.1		0.1		0.1							0.1		
COMBRETACEAE	*Terminalia circumalata*																40					
	Terminalia supranitifolia (P3)																					Y
COMMELINACEAE	*Commelina ensifolia*																					
CONVOLVULACEAE	*?Bonamia erecta*																					
	Bonamia pilbarensis																					
	Evolvulus alsinoides var. *villosicalyx*									0.1												

Family	species	40	41	54	42	43	44	45	46	47	48	49	50	51	52	53	55	56	57	58	59	OC
	Ipomoea costata		0.1																			
CUCURBITACEAE	*Cucumis variabilis*	0.1	0.1	0.1									0.1									
CYPERACEAE	*Cyperus vaginatus*																1					
	Cyperus blakeanus											0.1										
EUPHORBIACEAE	*Adriana tomentosa* var. *tomentosa*																					
	Euphorbia coghlanii		0.1																			
	Euphorbia tannensis subsp. *eremophila*								0.1		0.1											
FABACEAE	*Acacia ampliceps*																					
	Acacia ancistrocarpa																					Y
	Acacia bivenosa	0.1		0.1						10									0.1		5	
	Acacia colei var. *colei*	0.1										0.1										
	Acacia coriacea subsp. pendens			0.1									0.1				1					
	Acacia inaequilatera	30											15						5			
	Acacia pyrifolia																					
	Acacia synchronicia																					Y
	Acacia trachycarpa																1					Y
	Crotalaria medicaginea var. *neglecta*																					
	Crotalaria novae hollandiae subsp. novae hollandiae		0.1																			
	Cullen badocanum																					
	Dichrostachys spicata		0.1	0.1								0.1									0.1	
	Erythrina vespertilio																					
	Indigofera monophylla	0.1								0.1		0.1	0.1							0.1		
	Indigofera colutea																					
	Indigofera trita		0.1																			
	Rhynchosia bungarensis (P4)	0.1																				Y
	Rhynchosia minima	0.1	2	2								0.1	0.1						0.1			Y
	Senna artemisioides subsp. oligophylla																					Y
	Senna glutinosa subsp. *glutinosa*	0.1																				
	Sesbania cannabina																					
	Swainsona formosa																					Y
	Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)																					
	Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)		0.1										0.1									Y

Family	species	40	41	54	42	43	44	45	46	47	48	49	50	51	52	53	55	56	57	58	59	OC
	Tephrosia supina	0.1																				
GOODENIACEAE	*Goodenia microptera*											0.1										
	Goodenia lamprosperma																					
	Scaevola cunninghamii								5		0.1											Y
	Scaevola spinescens																					Y
LAMIACEAE	*lanceolatum*	0.1											0.1									
LAURACEAE	*Cassytha filiformis*									0.1												
MALVACEAE	**Malvastrum americanum*																					
	Abutilon fraseri																					Y
	Abutilon lepidum																		0.1	0.1		
	Brachychiton acuminatus																					
	Corchorus incanus subsp. incanus																					
	Corchorus incanus subsp. incanus	0.1										0.1										
	Corchorus walcottii											3	0.1								2	
	Gossypium australe																					Y
	Hibiscus sturtii var. campochlamys	0.1																				Y
	Lawrencia viridigrisea																					Y
	Melhania oblongifolia																					
	Sida fibulifera																					
	Triumfetta appendiculata	1										0.1	0.1						0.1	0.1	0.1	
	Waltheria indica																				0.1	
MENISPERMACEAE	*Tinospora smilacina*																					
	Tinospora smilacina																					
MOLUGINACEAE	*Trigastrotheca molluginea*											0.1										Y
MORACEAE	*Ficus brachypoda*																					
MYRTACEAE	*Corymbia hamersleyana*																					
	Eucalyptus victrix																40					
NYCTAGINACEAE	*Boerhavia gardneri*											1	0.1						0.1			
OLEACEAE	*Jasminum didymum* subsp. *lineare*																					Y
PASSIFLORACEAE	**Passiflora foetida* var. *foetida*																5					
PHYLLANTHACEAE	*Flueggea virosa* subsp. *melanthesoides*																					
	Notoleptopus decaisnei																					Y
	Phyllanthus maderaspatensis												0.1									
PITTOSPORACEAE	*Pittosporum phillyreoides*																					Y

Family	species	40	41	54	42	43	44	45	46	47	48	49	50	51	52	53	55	56	57	58	59	OC
PLANTAGINACEAE	*Stemodia grossa*																					
POACEAE	**Cenchrus ciliaris*		0.1	0.1	10				1		0.1						15	20				Y
	Chrysopogon fallax																					
	Cymbopogon ambiguus	0.1	0.1									0.1	0.1	15	10				0.1			
	Dactyloctenium radulans				0.1																	
	Eragrostis falcata				1																	
	Eriachne helmsii																					
	Eriachne mucronata																					Y
	Eriachne obtusa											0.1										Y
	Eriachne tenuiculmis									0.1												
	Paspalidium tabulatum								0.1		15											Y
	Paspalidium clementii																					
	Sporobolus virginicus								5		1.0											
	Themeda triandra																					
	Triodia ? basedowii (sterile)																					
	Triodia angusta									40												
	Triodia epactia	70	75	75					1	30	1	65	70	70	70				80	80	75	
	Triodia wiseana																					
PROTEACEAE	*Grevillea pyramidalis subsp. pyramidalis*	10		0.1								2	3						10	0.1	0.1	
	Hakea lorea subsp. *lorea*																					
SAPINDACEAE	*Alectryon oleifolius* subsp. *oleifolius*																					
SOLANACEAE	*Solanum diversiflorum*																					
	Solanum horridum	0.1								0.1		0.1	0.1									
	Solanum lasiophyllum																					
	Solanum phlomoides	0.1								0.1			0.1									
VIOLACEAE	*Hybanthus aurantiacus*																					
ZYGOPHYLLACEAE	*Tribulus hirsutus*																					

Appendix I: APM Multi-season flora survey Species Accumulation Curve

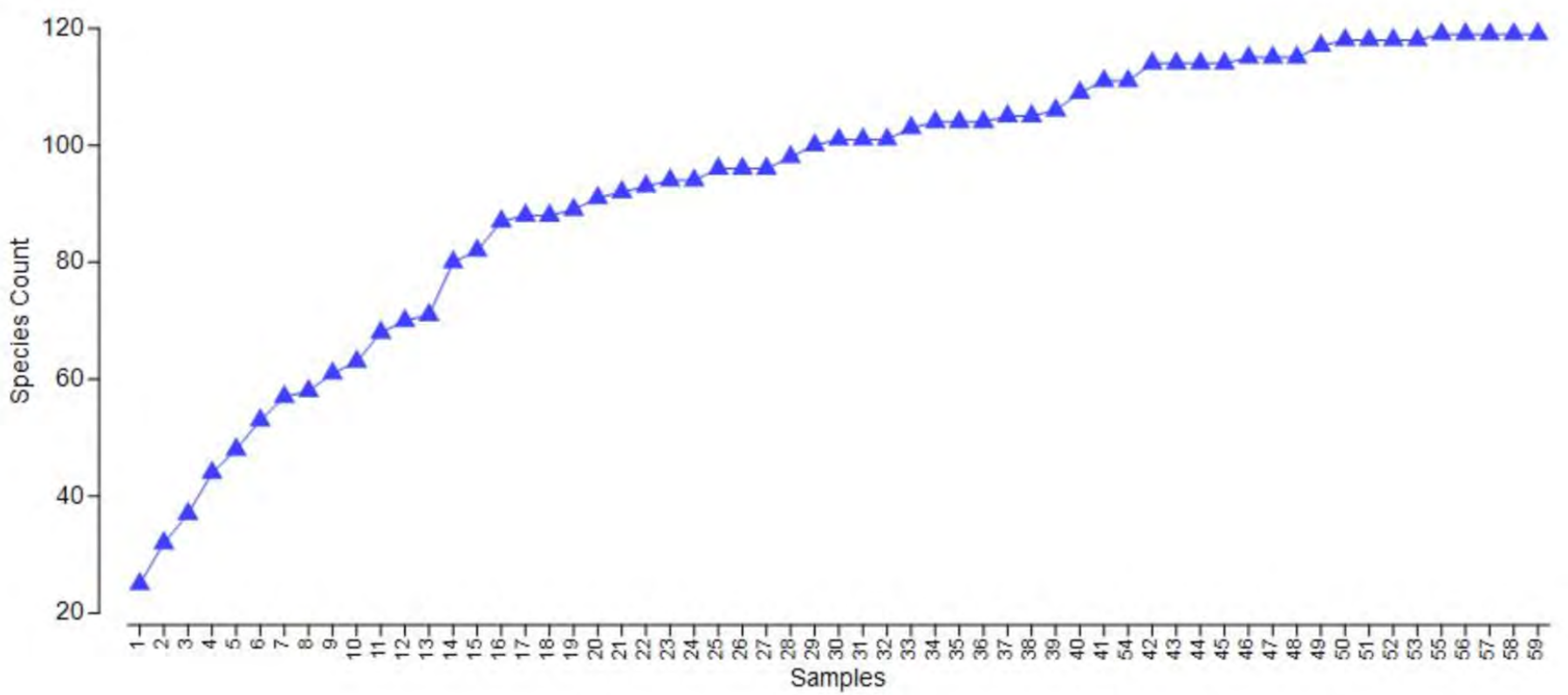


Figure I-1: Species Accumulation Curve for the multi-season flora survey. Species Count is the number of species recorded at each Detailed Survey Site (X axis: Samples) that had not been previously recorded in the APM Detailed Surveys. The species by site matrix used to derive the Species Accumulation Curve contained the full list of species recorded at each Detailed Survey Site over the multiple survey seasons.

APPENDIX J: BAT CALL IDENTIFICATION FROM THE BURRUP PENINSULA (SPECIALISED ZOOLOGICAL) (2018-2019)

Bat call identification from the Burrup Peninsula, WA

Type:	Acoustic analysis
Prepared for:	Animal Plant Mineral Pty Ltd
Date:	6 May 2019
Job No.:	SZ474-489

Prepared by:

Kyle Armstrong and Yuki Konishi
Specialised Zoological
ABN 92 265 437 422
Tel 0404 423 264
kyle.n.armstrong@gmail.com
http://szool.com.au

© Copyright - Specialised Zoological, ABN 92 265 437 422. This document and its content are copyright and may not be copied, reproduced or distributed (in whole or part) without the prior written permission of Specialised Zoological other than by the Client for the purposes authorised by Specialised Zoological ("Intended Purpose"). The Client acknowledges that the Final Report is intended for the sole use of the Client, and only to be used for the Intended Purpose. Any representation or recommendation contained in the Final Report is made only to the Client. Specialised Zoological will not be liable for any loss or damage whatsoever arising from the use and/or reliance on the Final Report by any third party. To the extent that the Intended Purpose requires the disclosure of this document and/or its content to a third party, the Client must procure such agreements, acknowledgements and undertakings as may be necessary to ensure that the third party does not copy, reproduce, or distribute this document and its content other than for the Intended Purpose. This disclaimer does not limit any rights Specialised Zoological may have under the *Copyright Act 1968 (Cth)*.

This report should be included as an appendix in any larger submission to Government, and cited as:

Specialised Zoological (2019). Bat call identification from the Burrup Peninsula, WA. Acoustic analysis. Unpublished report by Specialised Zoological for Animal Plant Mineral Pty Ltd, 6 May 2019, Job number SZ474-489.

Summary

Bat identifications from acoustic recordings are provided from the Burrup Peninsula, near Dampier in the Pilbara region of Western Australia. The identification of bat species from full spectrum WAV-format recordings of their echolocation calls was based on measurements of characteristic frequency, observation of pulse shape, and the pattern of harmonics. Eight species of bat were identified unambiguously as being present (**Tables 1–3**). Attribution of call types to species was straightforward for this dataset. The presence of the Ghost Bat *Macroderma gigas* (Megadermatidae) was detected based on one echolocation call sequence (at 19:29 on 2019-03-30; unit 536887) and one social call (at 05:20 on 2019-04-02; unit 498038). Representative echolocation calls for each identified species are illustrated (**Figure 1**), as recommended by the Australasian Bat Society (ABS 2006). Further details are available should verification be required.

Methods

Data were recorded in full spectrum WAV format with Titley Scientific AnaBat Swift and Pettersson Elektronik D500X bat detectors (sampling rate 500 kHz, set to turn on automatically at sunset and off at sunrise).

A multi-step acoustic analysis procedure developed to process large full spectrum echolocation recording datasets from insectivorous bats (Armstrong and Aplin 2014; Armstrong et al. 2016) was applied to the recordings made on the survey. Firstly, the WAV files were scanned for bat echolocation calls using several parameter sets in the software SCAN'R version 1.8.3 (Binary Acoustic Technology), which also provides measurements (in "SCAN'R output") from each putative bat pulse. The output was then used to determine if putative bat pulses measured in SCAN'R could be identified to species. This was done using a custom [R] language script that performed three tasks: 1. undertook a Discriminant Function Analysis on training data from representative calls from the Pilbara region; 2. from the measurements of each putative bat pulse from SCAN'R, calculated values for the first two Discriminant Functions that could separate the echolocation call types derived from the analysis of training data, and plotted these resulting coordinates over confidence regions for the defined call types; and 3. facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in Adobe Audition CS6 version 5.0.2. The [R] language script also included a separate process that repeated the above steps using training data that included signals from Pilbara cave roosting bat species to assist with the detection of echolocation calls of the Ghost Bat *Macroderma gigas*. Species were identified based on information in McKenzie

and Bullen (2009) and the author's own reference calls; and nomenclature follows Jackson and Groves (2015).

Limitations

The identifications presented in this report have been made within the following context:

1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).
2. The scope of this report extended to providing information on the identification of bat species in bulk ultrasonic recordings. Further comment on these species and the possible impacts of a planned project on bat species were not part of the scope.
3. In the case of the present report, the recording equipment was set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.
4. Other than the general locality of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a site visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion.
5. Specialised Zoological has had no input into the overall design of this bat survey, including its timing, recording site placement, nor degree of recording site replication.
6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.
7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be provided upon request.
8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. If an identification in the present report is ambiguous or in question, a trapping programme would help to resolve the presence of the possibilities in the project area.

References

ABS (2006). Recommendations of the Australasian Bat Society Inc for reporting standards for insectivorous bat surveys using bat detectors. *The Australasian Bat Society Newsletter* 27: 6–9. [ISSN 1448-5877]

Armstrong, K.N. and Aplin, K.P. (2014). Identifying bats in an unknown acoustic realm using a semi-automated approach to the analysis of large full spectrum datasets. Oral presentation at the 16th Australasian Bat Society Conference 22–25 April 2014, Townsville, Queensland. *The Australasian Bat Society Newsletter* 42: 35–36.

Armstrong, K.N., Aplin, K.P. and Crotty, S. (2016). A pipeline and app for massive filtering, and assisted inspection of enormous acoustic datasets. Poster presentation at the 17th Australasian Bat Society Conference, 29 March-1 April 2016, Hobart, Tasmania, Australia. *The Australasian Bat Society Newsletter* 46: 51.

Jackson, S.M. and Groves, C.P. (2015). *Taxonomy of Australian mammals*. CSIRO Publishing, Victoria.

McKenzie, N.L. and Bullen, R.D. (2009). The echolocation calls, habitat relationships, foraging niches and communities of Pilbara microbats. *Records of the Western Australian Museum* Supplement 78: 123–155.

Table 1. Species identified in the present survey from all sites combined.

MEGADERMATIDAE	
Ghost Bat	*Macroderma gigas*
EMBALLONURIDAE	
Common Sheath-tailed Bat	*Taphozous georgianus*
VESPERTILIONIDAE	
Gould's Wattled Bat Little Broad-nosed Bat Finlayson's Cave Bat	*Chalinolobus gouldii* *Scotorepens greyii* *Vespadelus finlaysoni*
MOLOSSIDAE	
White-striped Free-tailed Bat Greater Northern Free-tailed Bat Northern Coastal Free-tailed Bat	*Austronomus* (=*Tadarida*) *australis* *Chaerephon jobensis* *Ozimops* (=*Mormopterus*) *cobourgianus*

Table 2. Species identifications, with the degree of confidence indicated by a code—survey in November 2018. Date and serial/unit number correlates with site; see **Table 1** for full species names.

	C. jobensis	*O. cobourgianus*	*S. greyii*	*T. georgianus*	*V. finlaysoni*
D500X 1009					
19/11/2018	—	—	—	◆	—
D500X 1011					
19/11/2018	—	—	—	◆	—
20/11/2018	—	◆	—	◆	—
21/11/2018	—	—	—	◆	—
22/11/2018	—	—	—	◆	—
AnaBat Swift 450057					
19/11/2018	—	◆	◆	◆	◆
20/11/2018	◆	◆	—	◆	—
21/11/2018	—	—	—	◆	—
22/11/2018	—	—	—	◆	—
AnaBat Swift 450083					
19/11/2018	—	◆	◆	◆	◆
20/11/2018	—	◆	◆	◆	—
21/11/2018	—	◆	◆	◆	—
22/11/2018	—	—	◆	◆	—

Definition of confidence level codes:

— Not detected.

◆ Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the *Comments on identifications* section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

Table 3. Species identifications, with the degree of confidence indicated by a code—survey in April 2019. Date and serial/unit number correlates with site; see Table 1 for full species names and Table 2 for an explanation of confidence level codes.

	A. australis	*C. gouldii*	*C. jobensis*	*M. gigas*	*O. cobourgianus*	*S. greyii*	*T. georgianus*	*V. finlaysoni*
AnaBat Swift 497962								
30/03/2019	—	—	—	—	◆	◆	◆	◆
31/03/2019	—	◆	—	—	◆	◆	◆	◆
1/04/2019	—	—	◆	—	◆	◆	◆	◆
2/04/2019	◆	—	—	—	◆	◆	◆	◆
3/04/2019	—	—	—	—	—	◆	◆	◆
4/04/2019	—	—	—	—	◆	◆	◆	◆
5/04/2019	—	—	◆	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	◆	◆	◆	◆
AnaBat Swift 498038								
30/03/2019	—	—	—	—	◆	◆	◆	◆
31/03/2019	—	—	—	—	—	◆	◆	◆
1/04/2019	—	—	—	◆	◆	◆	◆	◆
2/04/2019	—	—	—	—	—	◆	◆	◆
3/04/2019	—	—	—	—	◆	◆	◆	◆
4/04/2019	—	—	—	—	—	◆	◆	◆
5/04/2019	—	—	—	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	◆	◆	◆	◆
AnaBat Swift 536846								
30/03/2019	—	—	—	—	◆	◆	◆	◆
31/03/2019	◆	—	—	—	—	◆	—	◆
1/04/2019	—	—	—	—	—	◆	◆	◆
2/04/2019	—	—	—	—	—	◆	◆	◆
3/04/2019	—	—	—	—	◆	◆	◆	◆
4/04/2019	—	—	—	—	—	◆	◆	◆
5/04/2019	—	—	—	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	◆	◆	◆	◆
AnaBat Swift 536887								
30/03/2019	—	—	—	◆	◆	◆	◆	◆
31/03/2019	—	—	—	—	—	◆	◆	◆
1/04/2019	—	—	—	—	◆	◆	◆	◆
2/04/2019	—	—	—	—	◆	◆	◆	◆
3/04/2019	—	—	—	—	◆	◆	◆	◆
4/04/2019	—	—	—	—	—	◆	◆	◆
5/04/2019	—	—	—	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	—	◆	◆	◆

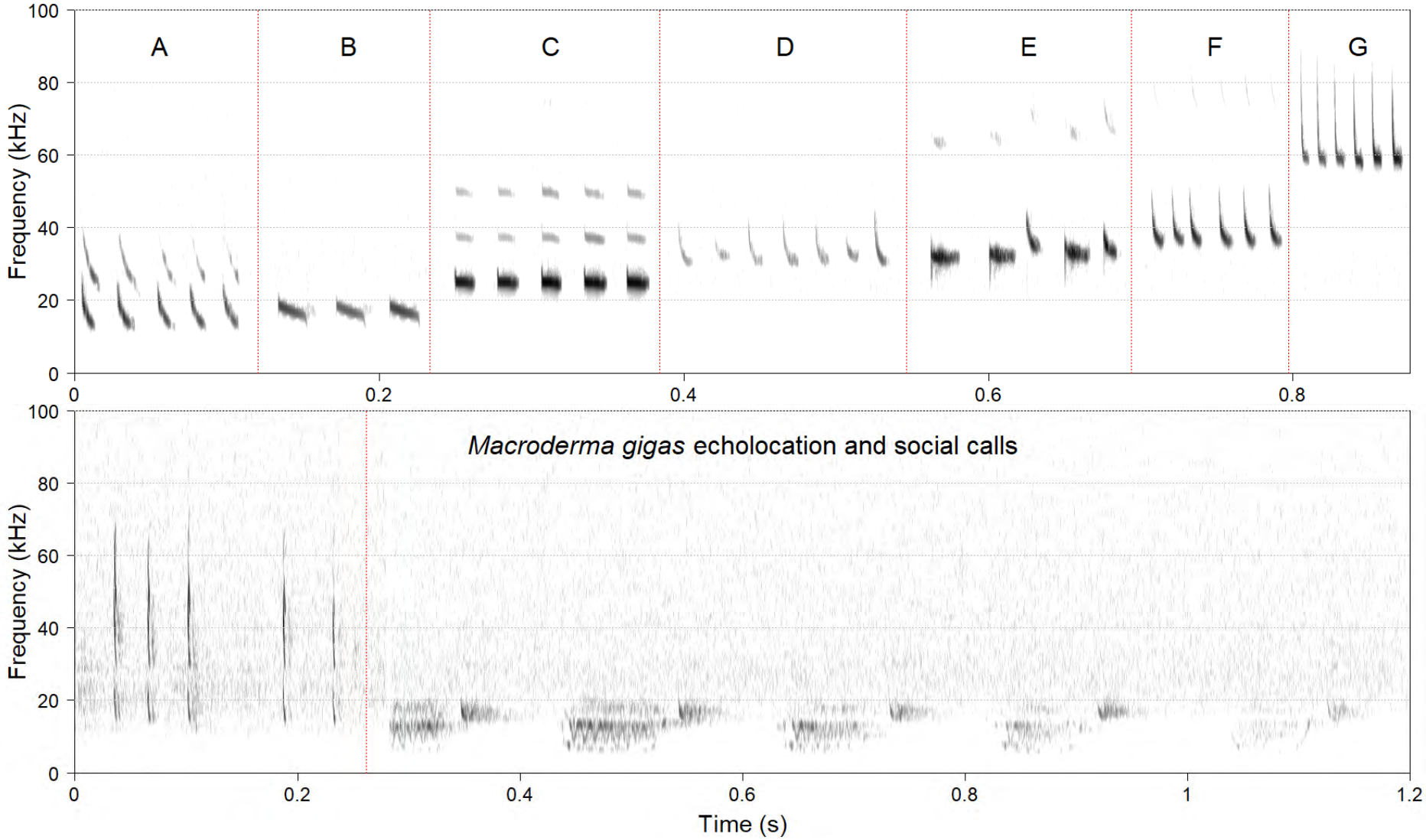


Figure 1. Representative call sequence portions of the species identified (**Top**: **A**: *Austronomus australis*; **B**: *Chaerephon jobensis*; **C**: *Taphozous georgianus*; **D**: *Chalinolobus gouldii*; **E**: *Ozimops cobourgianus* **F**: *Scotorepens greyii*; **G**: *Vespadelus finlaysoni*; time between pulses has been compressed).

APPENDIX K: BIRD CENSUS (APM, 2018-2019) RESULTS

Species	Pre Dry Season				Post Dry Season					Grand Total
	19/11/2018	20/11/2018	21/11/2018	22/11/2018	1/04/2019	2/04/2019	3/04/2019	4/04/2019	5/04/2019	
Australian Pipit				1	1	2	3	5	8	20
Black Kite							1			1
Black-eared Cuckoo							2	2	3	7
Black-faced Cuckoo-shrike	11		9	7	2	1	2	5	5	42
Black-faced Woodswallow	27	40	25	26	5	24	4	27	25	203
Black-shouldered Kite							1	1	4	6
Black-winged Stilt					1	3	9			13
Brahaminy Kite	3		1		1					5
Brown Falcon		3								3
Brown Goshawk							1			1
Brown Honeyeater			3		3		1	8	5	20
Brown Quail		2					2			4
Budgerigar					66					66
Caspian Tern									1	1
Common Greenshank					25	5	7			37
Crested Pigeon	12	3	17	4		2		4	8	50
Crimson Chat	1		2							3
Diamond Dove								2		2
Eastern Osprey	2									2
Fairy Martin			2		1			2		5
Galah		3	17	7		3		6		36
Grey Teal						1		2		3
Grey-tailed Tattler					36	15	6			57
Horsefield's Bushlark		2		1		1				4
Lesser Crested Tern	1									1
Little Corella	6	87	220	163						476
Little Egret	1			1	6	6	1	4	1	20
Magpie-lark							3		1	4
Nankeen Kestrel	2	5	2	2	5	2	2	3	5	28
Pacific Golden Plover					1					1
Painted Finch	46	22	36	14			6		6	130
Pallid Cuckoo					1			1	5	7
Peaceful Dove		3			3					6
Pied Butcherbird	1		5	2	8	11	12	6	15	60
Pied Cormorant							10			10
Rainbow Bee-eater		8								8
Red-backed Kingfisher		2	2	1	3			1	2	11
Red-browed Pardalote		2								2
Red-capped Plover		14		4	30	19	9	16	15	107
Red-necked Stint		1								1

Rufous Songlark		11	13	4	2	1	3	15	14	63
Silver Gull		2				1				3
Singing Honeyeater	43	57	40	30	27	17	13	29	28	284
Spinifex Pigeon	12	24	12	11	6	6		1	22	94
Spotted Harrier	1		1							2
Star Finch	8									8
Striated Pardalote					1	2	1	1		5
Torresian Crow	11	12	6	4		1	11	1		46
Tree Martin					8					8
Wedge-tailed Eagle				1						1
Weebill		6								6
Welcome Swallow					3		2		3	8
Whimbrel					2	1			2	5
Whiskered Tern					10	5	5	1		21
Whistling Kite	5	8	1	2		1	2	1	1	21
White-bellied Sea-eagle									1	1
White-faced Heron								1		1
White-plumed Honeyeater		15	27	9		19	10	12	9	101
White-winged Fairywren					4					4
White-winged Triller	4	10	7	1	5	3	3	9		42
Willie Wagtail	5	2	1	7	3	4	5	5	7	39
Yellow Throated Miner	26	35	20	8	26	10	10	20	35	190
Zebra Finch	15	164	71	58	82	14	13	21	29	467
Grand Total	**243**	**543**	**540**	**368**	**377**	**180**	**160**	**212**	**260**	**2883**

APPENDIX L: Species Accumulation Curve Memorandum

TO: CARDNO

Att: Daniel Hunter

Manager Environmental Approvals

Project: Perdaman Project, Burrup Peninsula, Western Australia.

Email: Daniel.Hunter@cardno.com.au

Ph: 08 6461 0739

DATE:

12 March 2020

FROM:

Dr Eleanor Hoy

Biological Sciences Manager

Animal Plant Mineral Pty Ltd

Phone (08): 6296 5155

Email: eleanor@animalplantmineral.com.au

RE: Species Accumulation Curve Memo for the Perdaman Project, Burrup Peninsula

Dear Daniel

A species accumulation curve (SAC) can be used to assess the effectiveness of sampling methods. This method of estimating species richness illustrates the accumulation of new species and plateaus when no new species are added to the assemblage. In other words, as the curve reaches an asymptote, it suggests that the majority of trappable species in the local assemblage have been sampled. More sampling effort is required to capture rare/cryptic species, and an accumulation curve can be used to interpret whether this is required (EPA, 2016).

1 METHODS

Data

The Perdaman Urea Plant Project (the **Project**) is located within the Burrup Strategic Industrial Area, on the Burrup Peninsula, approximately 13 km northwest of Karratha and 1,300 km north of Perth. To inform an Environmental Review, Animal Plant Mineral Pty Ltd (**APM**) was engaged to undertake: i) a Level 1 Biological Survey in the pre-wet season (19 – 22 November 2018); and ii) a Level 2 Biological Survey in the post-wet season (27 March – 5 April 2019).

Overall sampling effort was assessed using SACs. These analyses assume a standard sampling effort; therefore, avifauna consensus data from both surveys, and herpetofauna (reptiles and amphibians) and mammal fauna trapping data from the post-wet season survey were analysed. Given the restriction of the data, a subset of the fauna sampled were not represented in the estimates/curves (e.g. larger species captured on camera traps, or opportunistic recordings). Furthermore, as only four species of mammals were trapped, an SAC could not be estimated for the mammal fauna.

Analysis

A range of mean species richness estimates were generated using the software *EstimateS* (version 9; Colwell, 2013a). These include the Abundance Coverage-based Estimator of species richness (**ACE**); Incidence Coverage-based Estimator of species richness (**ICE**); classic forms of '**Chao1**' and '**Chao2**' estimators of species richness; first- (**Jack 1**) and second- (**Jack 2**) order jackknife estimators of species richness (incidence-based); **Bootstrap** estimator of species richness; and Michaelis-Menten estimator of species richness computed once for analytica rarefaction curve (**MMMean**). The methods/equations for estimating these values are reported in the *EstimateS* User Guide (Colwell, 2013b). Estimates were generated as sample-based incidence data, randomised across 100 permutations without replacement. The values represent theoretical maxima for the number of species present

within the sampled area. The ACE, ICE, Chao1, Chao2, and Jack1 methods estimate total species richness, including species not present in any sample (Colwell, 2013b). The Chao1 and 2 estimates are considered lower bounds of species richness and are more accurate with increased reference sample size (as with all estimators of species richness). While the MMMean method has previously been the most common method to estimate asymptotic species richness (and is, therefore, included in Table 1), it is considered by the developers of *EstimateS* as outdated as the data points are non-independent and serially correlated (Colwell, 2013b).

The observed species richness curve (**Sobs,** also known as Mao Tau) was calculated using the number of species in *t* pooled samples, given the reference sample. This curve along with a selection of the species richness methods (ACE, Chao1, and Jack1) were then plotted to create the SACs for the two fauna groups.

2 RESULTS AND DISCUSSION

The results of the mean species richness estimates are reported in Table 1, while the SACs for the avifauna and herpetofauna are illustrated in Figure 1 and Figure 2, respectively.

Table 1. Mean species richness estimates for the avifauna and herpetofauna survey data.

Species Richness	Avifauna	Herpetofauna
ACE	70.83	37.76
ICE	78.97	35.75
Chao-1	69.19	42.57
Chao-2	84.92	36.93
Jack-1	78.88	34.75
Jack-2	88.9	39.67
Bootstrap	69.61	29.92
MMMean	71.35	34.53
Observed	**63**	**26**

For the avifauna, the theoretical maximum number of species ranged from 69 to 89 species, compared to the 63 species observed (Table 1). This suggests that between 71 % and 91 % of avifauna were sampled, with an average of 14 species still unsampled (Figure 1).

For the herpetofauna, the theoretical maximum number of species ranged from 30 to 43 species, compared to the 26 species observed (Table 1). This suggests that between 61 % and 87 % of herpetofauna were sampled (Figure 2).

Additional species of both avi- and herpeto-fauna were recorded opportunistically or through other (non-systematic) capture methods, e.g. camera traps or spotlighting. These will likely help to provide a fuller representation of the true species richness at the Project area.

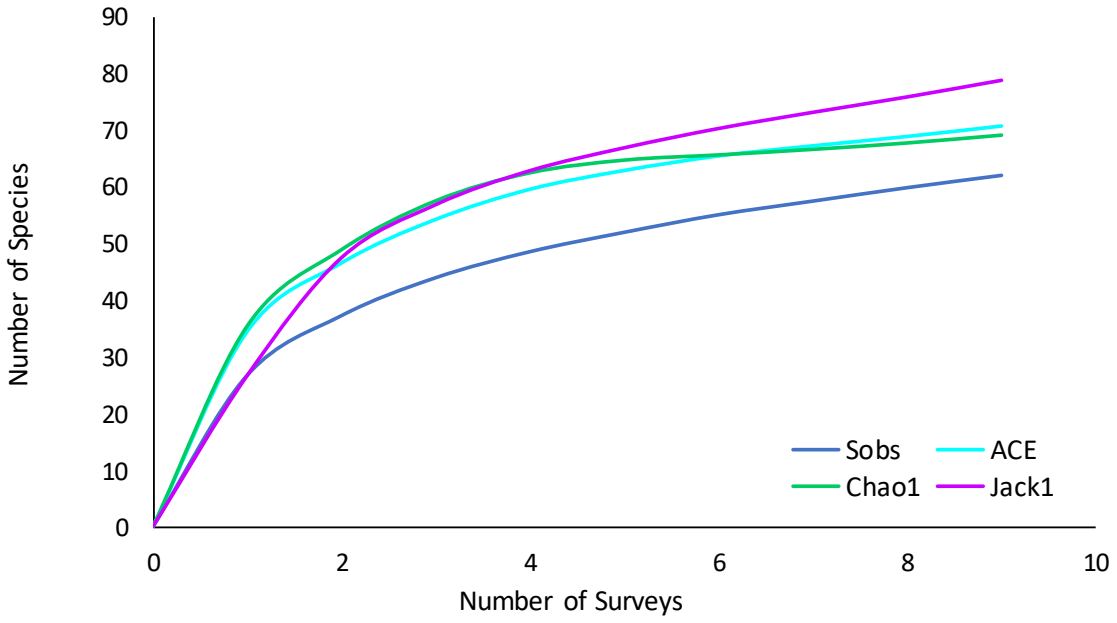


Figure 1. Species accumulation curve for avifauna.

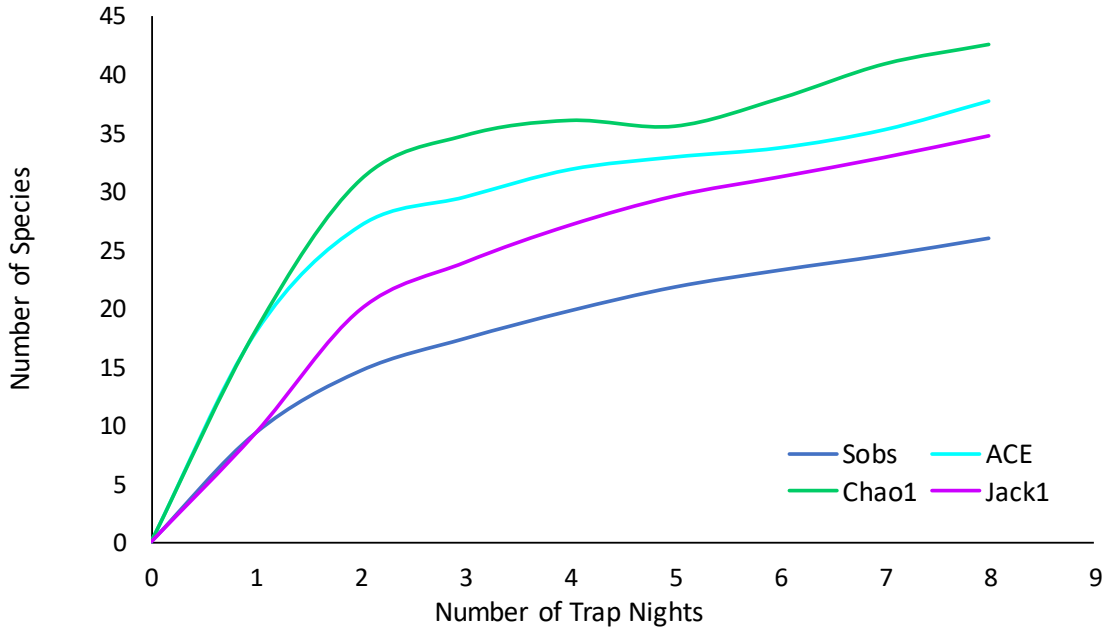


Figure 2. Species accumulation curve for herpetofauna.

3 REFERENCES

Colwell, R.K. (2013a). *EstimateS*: Statistical estimation of species richness and shared species from samples. Version 9. Persistent URL <purl.oclc.org/estimates>.

Colwell, R.K. (2013b). *EstimateS 9.1.0 User's Guide*. Available: http://viceroy.eeb.uconn.edu/estimates/EstimateSPages/EstSUsersGuide/EstimateSUsersGuide.htm

Environmental Protection Authority (EPA). (2016). *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*. Eds. B.M. Hyder, J. Dell, and M.A. Cowan. Government of Western Australia, Perth, 57 pp. Available: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Tech%20guidance-%20Sampling-TV-fauna-Dec2016.pdf

Attachment C – GHD Technical Memorandum, December 2023

Technical Memorandum

December 7, 2023

To	Chantal MacKenzie	**Contact No.**	+61 407 129 408
Copy to	Simon French Bluhm	**Email**	Chantal.MacKenzie@cloughgroup.com
From	Nicholas Priest	**Project No.**	12623554
Project Name	Perdaman Project Ceres – Biodiversity Conservation Act S40 Approval		
Subject	Conditions of Approval Amendment Risk Assessment Technical Memorandum		

1. Introduction

1.1 Purpose of this Memorandum

GHD has prepared this technical memorandum to provide Clough Group with a summary of the assessment of the potential impacts to threatened and priority species from a proposed amendment to Project Ceres' Management Actions and Approval Conditions with specific regard to the removal for the requirement to idle machinery for 30 minutes prior to work and the allowance of construction works during nighttime hours.

1.2 Scope and limitations

This technical memorandum has been prepared by GHD for Clough Group. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this memorandum are limited to those specifically detailed in the memorandum and are subject to any limitations or assumptions specially set out.

GHD has prepared this memorandum on the basis of information provided by the Client and others who provided information to GHD (which may also include Government authorities), which GHD has not independently verified or checked for the purpose of this memorandum. GHD does not accept liability in connection with such unverified information, including errors and omissions in the memorandum which were caused by errors or omissions in that information.

Accessibility of documents

If this Technical Memorandum is required to be accessible in any other format this can be provided by GHD upon request and at an additional cost if necessary.

2. Background

Under Part IV of the *Environmental Protection Act 1986* (WA), an assessment was carried out, and approval issued, for Perdaman Project Ceres (the Project) under Ministerial Statement 1180 (MS 1180). Concurrently, the Project was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). The Commonwealth Department of Climate Change, Energy, the Environment (DCCEEW) issued an approval (EPBC 2018/8383) on 26 February 2022.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

The Western Australian Environmental Protection Authority (EPA) considered Flora, Vegetation and Terrestrial Fauna as Key Environmental Factors to be managed throughout the life of the Project. In relation to flora and fauna management, and in accordance with MS 1180, Perdaman submitted and had approved by the EPA CEO:

- Fauna Management Plan, (PCF-PD-EN-FaMP).
- Threatened Species Management Plan, (PCF-PD-EN-TSMP).

The FaMP and TSMP were reviewed and approved by the EPA and the Commonwealth Department of Climate Change, Energy, the Environment (DCCEEW). The Approved TSMP includes the following provisions:

Management Action 9 - Construction and/or clearing within the development envelope will only occur in daylight hours to minimise noise, vibration and artificial lighting impacts on terrestrial fauna.

- Trigger Criterion: Clearing works conducted 1 hour prior to dusk (sundown).
  - Threshold Criterion: Clearing works conducted after sundown.

Management Action 14 - Machinery will idle for at least 30 mins, prior to the commencement of vegetation clearing activities.

- Trigger Criterion: Machinery not inspected or started during pre-start.
  - Threshold Criterion: Machinery not left in idle for 30 minutes before mobilisation.

In order to conduct the required works, an '*authorisation to take or disturb threatened species* under section 40 of the *Biodiversity Conservation Act 2016* (WA) was obtained (Authorisation number - TFA 2223-0317). That approval was issued with the following conditions:

Threatened species authorised to be taken/disturbed (including conservation status):

- Night parrot (*Pezoporus occidentalis)*
- Northern quoll (*Dasyurus hallucatus*)
- Pilbara olive python (*Liasis olivaceus barroni)*
- Northern coastal free-tailed bat (*Mormopterus cobourgianus*)
- Ghost bat (*Macroderma gigas*)
- Bilby (*Macrotis lagotis)*
- PiIbara leaf-nosed bat (*Rhinonicteris aurantia* (Pilbara form))

Other threatened species identified for assessment:

- Curlew sandpiper (*Calidris ferruginea*)
- Red knot (*Calidris canutus*)
- Siberian sand plover (*Anarhynchus mongolus*)
- Bar-tailed godwit (*Limosa lapponica baueri*)
- Australian fairy tern (*Sternula nereis nereis*)
- Great knot (*Calidris tenuirostris*)
- Eastern curlew (*Numenius madagascariensis*)

Authorised taking/disturbance methodology:

To avoid or minimise adverse impacts to the above listed threatened species, the proponent will undertake the following:

- During clearing and construction activities the proponent will undertake the following actions:
  - clearing and construction activities will only occur during daylight hours.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Relevant Conditions

8. The Authorisation Holder must undertake the Authorised Activity, including any mitigation measures, as specified in the signed application dated 22 March 2023, *Environmental Protection Act 1986* conditions of approval outlined in MS 1180, *Environmental Protection and Biodiversity Conservation Act 1999* conditions of approval outlined in EPBC 2018/8383, and **all approved Management Plans associated with the Perdaman urea plant project including subsequent edited and approved versions, unless otherwise authorised.**

In summary, Condition 2 and Condition 8 of the S40 approval required the project the implement those management actions outlined in the TSMP (Action 9 & 14) to reduce the risk of impact to Threatened terrestrial fauna species.

2.1 Proposed Amendments

It is understood the proposed amendment(s) are to remove condition 2(a) of the S40 and to amend to allow for night works to be conducted during the construction phase of the project, and for the removal of the requirement for machinery to idle prior to the commencement of works.

2.2 Site Works Required

Saipem Australia PTY LTD & Clough Projects Australia PTY LTD Joint Venture (SCJV) has stipulated that night works are planned for the duration of construction and commissioning. Construction and commissioning are considered to include:

1. Start of Night Shift May 2024 (Month 12) - Civils
    a. Concrete Batch Plant - A semi-permanently fixed plant for the manufacture/blending of raw material, sand, cement, aggregate stone & water to produce concrete which is dispatched through chutes into mobile agitator trucks for delivery to the construction site.
    b. Concrete pours – too hot during the day.
    c. Concrete pump/concrete kibble for concreting (pump & franna/crane operation)
    d. Formwork – low intensity noise
    e. Reinforcing steel bar installation
    f. Precast yard setup and precast concrete
    g. Precast segments movements in precast yard
    h. Transportation and receipt of precast concrete segments (if outside of Burrup)
    i. Grouting activities (manual/grout pump)
    j. Delivery of aggregates/cement in batching plant laydown
    k. Earthworks: materials transportation to Site C via causeway
    l. Stockpile movement of bulk earthworks materials at different locations
    m. Placement and compaction of bulk earthworks materials
    n. Concrete truck movements/concreting activities towards port area
    o. Drilling (preparation for blasting)
    p. Placement of blast mats (as required) with crane
2. Construction Phase (Months 20-42)
    a. Non-destructive testing - ultrasonic or X-ray testing of welds or pipe wall thicknesses for quality assurance/quality control purposes.
    b. Welding works - electric MIG or TIG fusion welding of mild steel or stainless-steel structural steel, pipes, tanks.
    c. Scaffolding works - the erection of temporary tube and fitting structures to gain access at height for construction activities.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

d. Hydro/pneumatic testing - pressure testing by water or air to test the integrity of pipes, welds, and flanges.
e. Material movements - delivery of all components for construction of the plant generally via truck or SPMT (self-propelled module transporter).
f. Critical path construction activities - key fundamental activities to achieve and maintain the construction schedule on time and budget.
g. Conveyor corridor construction
h. Probably night shift works may be planned in LA30 for module dressing etc.
i. Piping/equipment installation
j. Module installation (securing & positioning)

3. Commissioning (Months 32-50)
   a. All commissioning related activities (24hrs) - The initial energisation, start up and performance testing of all systems of the plant.

Crushing and screening activities, and blasting, will not occur between 6pm and 6am.

3. Methods

GHD has conducted a review of the relevant information provided in relation to the project, including:

– Perdaman Urea Project Pre and Post-Wet Season Biological Survey, APM, 2019
– Fauna Management Plan, PCF-PD-EN-FaMP
– Threatened Species Management Plan, PCF-PD-EN-TSMP

GHD also conducted a fauna trapping and translocation program in September 2023 across the project area, the results of which were also used to inform the assessment. Based on the information available, a likelihood of occurrence was determined for each of the threatened species considered under the S40 approval.

GHD then considered the potential impacts of the proposed amendments on those species considered as possible or likely to occur within the project area. The potential for impact was given an overall risk grade; red being high risk, yellow being moderate and green being low (see Table 1).

Table 1 Summary of risk of impact to threatened species as a result of proposed amendments.

Risk Category	Description
High	There is a significant and heightened risk to threatened species that impacts associated with night works will detrimentally affect the species at the species level. There is a high likelihood that individuals of a threatened species may be negatively impacted by night works and removal of the idling condition. Mitigations and management actions may reduce this risk.
Moderate	There is a moderate risk to threatened species that impacts associated with night works will detrimentally affect the species at the species level. There is a moderate chance that individuals of a particular threatened species may be impacted by nightworks and the removal of the idling condition. Mitigations and management actions may reduce this risk.
Low	There is a low risk to threatened species that impacts associated with night works will detrimentally affect the species at the species level. There is a low chance that individuals of a particular threatened species may be impacted by nightworks and the removal of the idling condition. Mitigations and management actions may reduce this risk even further.
Negligible	There is a negligible risk to threatened species that impacts associated with night works will detrimentally affect the species at the species level. There is a very low chance that individuals of a particular threatened species may be impacted by nightworks and the removal of the idling condition.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

4. Results

4.1 Night Parrot (*Pezoporus occidentalis*)

The night parrot is an avian species thought to be extinct until it was rediscovered in Queensland in 2013. Subsequently, the species has been discovered and confirmed in the Wiluna district of central Western Australia (WA) and the Lake Gregory area of northern WA. Night parrot is listed as critically endangered under the WA *BC Act* 2016 and as endangered under the *EPBC Act* 1999. The species is a cryptic, nocturnal, ground dwelling parrot with habitat parameters confined to arid and semi-arid zones (DCCEEW, 2023). Preferred habitat is characterised as mature spinifex on stony rises, sandy lowlands, shrubby glasswort, chenopods, succulents on flats around salt lakes, flooded claypans and saltbush thickets (Pizzey and Knight, 2020). Night parrots roost and nest using a tunnel-like spaces inside large spinifex clumps. A rough bowl of sticks and grass holds a clutch of between 2-5 white, oval eggs (Morcombe, 2020).

With the species only rediscovered a decade ago, there are apparent shortfalls in the knowledge of the species' basic parameters such as range and population size. Leseberg *et al.* (2021), note that the species persists in only two broad regions, western Queensland and central and northern western Australia and is probably extinct throughout much of its former range. The Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW) outline a distribution of the species where it is *likely* to occur and where it *may* occur. The *likely to occur* core range is restricted to inland western Queensland and inland northern WA. The Burrup Peninsula is located within the "*may occur* "zone although it should be noted that these distributions have been generalised to 10km and smaller scaled distribution may be more nuanced (DCCEEW, 2016).

The species population is expected to be no more than 250 mature individuals with no more than 50 individuals in each sub-population. Targeted surveys across Australia since 2013 have detected no more than 30 individuals though it should be acknowledged it is difficult to survey the entire suitable habitat range. Birdlife International argues that "*the failure to find many additional sites, despite searching, suggests that it is prudent to assume there may be no more*" (Birdlife International, 2023).

The Night parrot was not identified during previous biodiversity surveys at the project CERES site (Worley Astron, 2006, APM, 2019 and GHD, 2023). While it was identified that the habitat requirements of this species are met to a certain extent in the immediately adjacent area, it is considered highly unlikely to inhabit the project area as night parrot are extremely rare and occur in low numbers as outlined above.

As most detections or observations of night parrot have occurred in remote areas distant from industry, it is unclear how artificial lighting and anthropogenic sources of light, noise, dust and vibration may impact the species. A confirmed record of the species call detected adjacent to the Fortescue Metals Group Cloudbreak iron ore mine in the central Pilbara region may suggest the species may be tolerant of a certain level of industrial activity (FMG, 2021). It should be noted that substantial industrial activity currently occurs during night hours on the Burrup peninsula in the form of existing gas and fertiliser plants.

Considering the very low likelihood of Night Parrot occurring in the project area, the proposed amendment to approval conditions allowing for night works and the removal of machinery idling component is considered to pose a **low** risk of adverse impacts.

Furthermore, if the following simple mitigation measures are adopted the residual risk may be reduced to **negligible**:

- To limit any possibility that night parrot (and other native fauna) are attracted to the project site, it is recommended limiting the availability of standing water on the project site as birds may be attracted to the water source.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

of the potential to encounter threatened species (particularly Pilbara olive python and Northern quoll) whilst driving at night and the importance of observing the speed limit.

- Minimise impulsive noise (banging tail gates, loud hammering etc) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered.

Table 2: Assessed residual risk of proposed condition amendments to night parrot.

Risk Category	Description
Low	Extremely low likelihood species will occur on or near the project site.
Negligible	After applying mitigations measures.

4.2 Northern Quoll (*Dasyurus hallicatus*)

The Northern quoll is Australia's smallest quoll species and is largely nocturnal. The species' habitat is characterised by rocky escarpments, eucalypt forest and woodland and around human habitation. The species is considered extinct across most of its former range and rapidly declining in its current range, largely due to the encroachment of the cane toad (*Rhinella marinus*) and predation by feral cats (*Felis catus*) (Van Dyck *et al*, 2013). Extant populations occur in the Pilbara, Kimberley, parts of the Northern Territory and near-coastal Queensland. Remnant populations are associated with significant rocky outcrop areas (DCCEEW, 2023).

Records from the Pilbara bioregion are scattered across the four subregions: namely the Hamersley Range, Fortescue Plains, Chichester and Roebourne Plains subregions with records extending as far west as the Little Sandy Desert and as far south as Karinjini National Park. The majority of recent records however have come from the Rocklea, Macroy and Robe land systems (DCCEEW, 2023).

The Northern quoll habitat usually encompasses rocky outcrop habitats where females den in large rock crevices; raising a litter of up to eight young.

Previous radiotracking assessments have shown that Northern quolls have an average home range of approximately 35ha with no discernible difference between females and males before the mating season but male ranges extended out to >100km during the mating season between June to August (Oakwood 2002). It was observed that within home ranges, male Northern quolls can move up to 5km per night while female can move up to 2.8km per night (Henderson, 2015).

The Perdaman Fauna Management Plan states: "*There are records of this species in the King Bay Supply Base just south of the Project area and about 2km northeast in the rocky outcrops south of the Woodside Southern Expansion Lease Yard. This suggests the species may be inhabiting these developed areas for foraging*". The project site does not feature rock crevices large enough for denning, however the expansive rocky outcrops to the north and south of the project site feature suitable denning resources.

While no denning habitat is currently available in the project area, it is assumed the species persists in low numbers on the Burrup Peninsula. The home ranges of individual Northern quoll likely overlap with the project site and there may be an increased risk that males may be recorded on site in a transitory nature during the breeding season. As Northern quolls are primarily nocturnal, construction activities at night may increase the potential for direct impacts from vehicular strike and indirect impacts through disturbance to individuals' transit and reduced foraging and breeding opportunities. Artificial lighting is known to increase invertebrate activity, and this can attract both Northern quoll and introduced predators such as cats, foxes and wild dogs. It is possible that the presence of human infrastructure, and the availability of resources within these areas, such as rubbish, scraps and insects attracted to the artificial light, attracts Northern quoll to move outside of their normal home range. (Henderson, 2015).

With the low abundance of Northern quolls in the project area and aforementioned potential impacts from proposed amendments to the project, the overall risk to this species is considered **moderate**.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Some relatively simple mitigation measures, outlined below, may reduce this risk to **low**

Mitigation Measures:

- Impose strict speed restrictions of 40km/hr for all site vehicles between dawn and dusk. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species, particularly Pilbara olive python, Northern quoll, Pilbara leaf-nosed bat, Northern coastal free-tailed bat and ghost bat.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species (particularly Pilbara olive python and Northern quoll) whilst driving at night and the importance of observing the speed limit.
- Minimise impulsive noise (banging tail gates, loud hammering etc) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered.
- Ensure food scraps/rubbish is contained securely on site and disposed of responsibly.

Table 3: Residual risk of proposed amendments to Northern quoll before and after mitigation measures.

Risk Category	Description
Moderate	Northern quolls likely persist on the Burrup Peninsula but in very low numbers. Night works may increase the likelihood of vehicular interactions and road strike and may disrupt dispersal and foraging activities. Artificial lighting is known to increase invertebrate activity, and this can attract both Northern quoll and introduced predators such as cats, foxes and wild dogs increasing potential interactions between the species. Some mitigation options may reduce the risk of negative interactions with the species.
Low	After applying mitigations.

4.3 Pilbara Olive Python (*Liasis olivaceus barroni*)

The Pilbara subspecies of olive python is restricted to gorges, rocky escarpments and water holes of Pilbara and Gascoyne regions of WA (Wilson & Swan, 2017). The Burrup Peninsula population prefers granophyre rock-piles, though occasionally are found in neighbouring spinifex grasslands. Individuals, especially males, travel large distances, suggesting the species has a large home range (Tutt et al 2002). Radio tracking of this species has demonstrated that they occupy large home ranges of between 87ha and 450ha. Males have larger home ranges than females (Tutt *et al*, 2004) and during the breeding season, which occurs from June to August, males can move long distances (up to 4km) in search of females. The species' diet is comprised of large mammals including rock wallabies (*Petrogale* sp.), wallaroos (*Macropus robustus*), fruit bats (*Pteropus* sp.), ducks, spinifex pigeons (*Geophaps plumifera*) and pheasant coucals (*Centropus phasianinus*) (Pearson, 2003).

During the mating period, males and females often move into shelter, such as a cave or rock crevice, and remain together for up to three weeks. Eggs are laid in October and hatch in approximately January. Little is known about incubation or the average number of young. Young disperse from the place of birth, searching for food (Pearson 2003).

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Pilbara olive pythons are known to occur within adjacent habitat to the project site with an individual recorded 1.6km to the north of the site in September 2023. Therefore, it is probable that Pilbara olive python has the potential to move through the project area during the construction and commissioning phase of the project.

The proposed amendment to allow for night works to proceed on the project site may increase the risk that Pilbara olive pythons transiting through the site are killed or injured. Due to their slow movement and extensive home ranges, Pilbara olive pythons are susceptible to road strike making impacts from vehicles a key threat (Pearson 2003). Increased night activities on the project site may also adversely affect prey abundance, subsequently restricting potential foraging opportunities for Pilbara olive python. For the above reasons, the potential risk to Pilbara olive python through the proposed amendments is considered **moderate.**

By implementing mitigation and management measures outlined below, the loss of Pilbara olive python individuals associated with the Proposed Amendment can be minimised and is not expected to cause significant impacts to the species resulting in a risk rating of **low**.

Mitigation Measures:

- Impose strict speed restrictions of 40km/hr for all site vehicles between dawn and dusk. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species, particularly Pilbara olive python, Northern quoll, Pilbara leaf-nosed bat, Northern coastal free-tailed bat and ghost bat.
- Minimise impulsive noise (banging tail gates, loud hammering etc) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered. **This mitigation is especially important for this species**.
- Where possible, target any drilling activities away from the periphery of the project during nighttime hours, with particular consideration given to adjacent rock stacks where Pilbara olive pythons may inhabit. **This mitigation is especially important for this species**.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species (particularly Pilbara olive python and Northern quoll) whilst driving at night and the importance of observing the speed limit.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- To limit any possibility that native fauna are attracted to the project site, it is recommended limiting the availability of standing water on the project site.

Table 4: Residual risk of proposed amendments to Pilbara olive python before and after mitigation measures.

Risk Category	Description
Moderate	Pilbara olive pythons occur in the adjacent habitat. Night works may increase the likelihood of vehicular interactions and road strike and may disrupt dispersal and foraging activities.
Low	After applying mitigations.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

4.4 Ghost bat (*Macroderma gigas*)

The ghost bat is Australia's largest echolocating and only carnivorous bat and is restricted to several disjunct populations in the north of Australia, including a population in the Pilbara region of Western Australia (Cramer *et al*, 2022). The diet of ghost bat is varied and includes many small vertebrates. In the Pilbara, Ghost Bat consume at least ten other bat species in addition to birds, frogs, reptiles and terrestrial mammals (Bat Call WA 2021). The preferred habitat of the ghost bat is deep, dark and humid caves in banded ironstone or abandoned underground mines (Bat Call WA, 2021). Granite rockpiles are also used in the eastern Pilbara (Armstrong & Anstee, 2000).

The distribution of ghost bats in the Pilbara is largely determined by the presence of suitable roosting sites, either natural caves or man-made mines (Biologic, 2019). There are no known ghost bat roost sites or maternity caves within the project site or directly adjacent, however the site will potentially form part of some individuals' foraging range. A recent record of a deceased ghost bat was identified at Hearson's Cove from September 2023, approximately 1.9km to the east of the project site, confirming the species presence in the area. In addition, the 2019 APM survey detected ghost bats on two nights in rocky outcrop and mid-slope habitats (APM, 2019).

Cramer et al (2022) state: "*The most severe threat to ghost bats in the Pilbara region is the destruction and disturbance of habitat due to mining operations, but disturbance to their roosts from other infrastructure developments and changes to and loss of foraging habitat also pose significant threats*."

Ghost bats have excellent vision, and it is possible that high dust levels could irritate the eyes or reduce vision and affect their ability to capture prey and for this reason dust is believed to have a moderate level of impact to the species (Biologic, 2019). However, there are a number of persistent ghost bat roosts in close proximity (<500 metres) to mining operations across the Pilbara which suggest they have some tolerance to anthropogenic activities (Bat Call WA 2021). Ghost bats can also fly low to the ground whilst hunting, making them susceptible to inappropriate fencing (Cowan, 2023).

Altered light environments may affect foraging, reproduction, migration, and communication of nocturnal volant species (Longcore & Rich, 2004). The most likely disturbance responses on bats from increases in light spill are the avoidance of illuminated areas previously used for foraging by light-sensitive species, or changes to prey item aggregation for insectivorous species resulting in changes to foraging behaviour. While ghost bats require darkness in diurnal roosts, there is anecdotal evidence that ghost bats are not light-phobic when foraging (E. Westerhuis *pers comms* 28th November 2023). Therefore it is unclear if artificial lighting will directly impact the species. Artificial lighting has been shown to change the established flight routes and delay commuting behaviour in other small bat species, with the potential of forcing bats to use suboptimal flight routes or cause isolation from preferred foraging sites (Cramer *et al*., 2016; Stone *et al*., 2009). This suggests that there may be indirect impacts to Ghost Bats through prey species avoiding areas with artificial light. In addition, the strong and persistent lighting used at mine sites creates a 'perpetual full moon' (Longcore & Rich, 2004) that has the potential to affect the timing of activity in crepuscular and nocturnal species and to allow diurnal and crepuscular predators to become facultative nocturnal predators (Gaston et al., 2012). It should be noted that substantial industrial activity currently occurs during night hours on the Burrup peninsula in the form of existing gas and fertiliser plants.

The proposed amendment to allow for night works to proceed on the project site may reduce ghost bat foraging opportunities in the project area. There is also potential for vehicle strike to occur and impacts from dust generation. For the above reasons, the potential risk to ghost bat through the proposed amendments is considered **moderate.**

By implementing mitigation and management measures outlined below, the loss of ghost bat individuals associated with the Proposed Amendment can be minimised and is not expected to cause significant impacts to the species resulting in an overall risk rating of **low**.

Mitigation measures:

- Impose strict speed restrictions of 40km/hr for all site vehicles between dawn and dusk. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species,

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

particularly Pilbara olive python, Northern quoll, Pilbara leaf-nosed bat, Northern coastal free-tailed bat and ghost bat.

- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- During dry weather, ensure dust suppression is in place to reduce any potential impacts from excessive dust production.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Reduce the use of mesh and barbed wire fences on the project site, limiting the likelihood bats will be impacted by fencing.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species (particularly Pilbara olive python and Northern quoll) whilst driving at night and the importance of observing the speed limit.

Table 5: Residual risk of proposed amendments to ghost bat before and after mitigation measures.

Risk Category	Description
Moderate	Ghost bats occur in the project site area. Although no roost sites or maternity caves have been identified, impacts to foraging regimes through noise, light spill, fencing and dust may impact a certain number of foraging individuals. Several mitigation options may reduce this risk rating and lessen the impact on ghost bats.
Low	After applying mitigations.

4.5 Bilby (*Macrotis lagotis*)

The bilby is an iconic burrowing marsupial with significant conservation and cultural value in Australia. The solitary species is considered an important ecosystem engineer and indicator species of environmental conditions (Dziminski *et al*, 2020).

The bilby once ranged over much of the arid and semi-arid Australian mainland but is now known from primary populations found in the Tanami Desert of the Northern Territory, the Great and Little Sandy Deserts, Gibson Deserts and parts of the Pilbara and Kimberley regions of Western Australia and one isolated population in south-west Queensland (Australian Museum, 2023). These populations occupy habitats consisting of open tussock grassland on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises and hummock grassland in plains and alluvial areas (DCCEEW, 2023 – Conservation Advice).

Dziminski *et al,* in 2020, accurately defined the western extent of the current bilby range. There is a distinct line of occurrence that runs south-east of Port Hedland with a buffer of approximately 100km to the west of this line where a handful of bilby records have been recorded in the past. The Burrup Peninsula is represented by the "*no recent or historical bilby records*" category.

No bilbies were recorded by APM in 2018/19 or by Worley Astron in 2006. No records from federal or state databases occur within 25km of the project site. APM further argues that the species is highly unlikely to occur in or adjacent to the project area due to lack of appropriate burrowing substrate and the presence of foxes and feral cats (APM 2019).

Due to it being extremely unlikely the species exists on or near the project area, the risk rating allocated to the species is **low.** If the below mitigation measures are adopted, the risk rating may drop to **negligible**.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Mitigation measures:

- Impose strict speed restrictions of 40km/hr for all site vehicles between dawn and dusk. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species, particularly Pilbara olive python, Northern quoll, Bilby, Pilbara leaf-nosed bat, Northern coastal free-tailed bat and ghost bat.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species (particularly Pilbara olive python and Northern quoll) whilst driving at night and the importance of observing the speed limit.
- Minimise impulsive noise (banging tail gates, loud hammering etc) and vibration. Limit compaction to plate compactors and use rollers without vibration where practical. Any use of vibration at nighttime should be minimised and conducting works where vibration is required during the daytime hours considered.

Table 6: Residual risk of proposed amendments to bilby before and after mitigation measures.

Risk Category	Description
Low	Extremely low likelihood species will occur on or near the project site.
Negligible	After applying mitigations.

4.6 Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)

The Pilbara leaf-nosed bat is a small insectivorous bat that occurs throughout the Pilbara and adjacent upper Gascoyne regions of Western Australia. The species relies on underground roosts supporting warm, high humidity microclimates. Only relatively deep, complex caves and disused underground mines contain such conditions—these are relatively uncommon and may act to limit the area of occupancy of the species (DCCEEW, 2023). Primary threats to the species include impacts from mine collapse or changes to cave climate parameters, mine development, including blasting and underground works. Human disturbance of roost sites and roadkill are also listed as contributing threatening factors (DCCEEW, 2023).

The species is usually recorded foraging in gorges and gullies, over pools and spinifex hummock grasslands (Van Dyck *et al*, 2013). Whilst cave systems suitable for the species may be present in the adjacent Murujuga National Park, these systems are quite uncommon. The bat would be more likely to use the project area for foraging, and potentially use shallower caves provided by the outcrops within the National Park as a temporary refuge in the wet-season as they can forage several kilometres from their day-time roost sites (APM, 2019).

Excessive light is likely to influence the natural foraging behaviour of the species, which is thought to be attracted to light sources (Cramer *et al*., 2016). A long-term study at Atlas' Mt Dove project have shown that Pilbara leaf-nosed bat activity is not negatively impacted by artificial illumination and can possibly increase presumably due to increased foraging resources available (Bat Call, 2021). This increase in activity or attraction to artificial lighting may expose the species to a high risk of vehicular strike during night works at the site.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

The species was not recorded by APM in 2018/19 surveys, nor was it detected by Worley Astron in 2006. There are no state or federal database records of the species within 25km of the project site. It is considered unlikely the species occurs in significant numbers within the study area. Mitigations to reduce impacts of lighting and dust may lessen the chance of attracting foraging individuals to the site thereby reducing the possible impact of negative vehicular interactions.

The risk rating for the species is considered low and may be negligible after applying the following mitigation measures.

Mitigation Measures:

- Impose strict speed restrictions of 40km/hr for all site vehicles between dawn and dusk. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species, particularly Pilbara olive python, Northern quoll, Pilbara leaf-nosed bat, Northern coastal free-tailed bat and ghost bat.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species (particularly Pilbara olive python and Northern quoll) whilst driving at night and the importance of observing the speed limit.
- Reduce the use of mesh and barbed wire fences on the project site, limiting the likelihood bats will be impacted by fencing.

Table 7: Residual risk of proposed amendments to Pilbara leaf-nosed bat before and after mitigation measures.

Risk Category	Description
Low	Low likelihood species will occur on or near the project site.
Negligible	After applying mitigations.

4.7 Northern Coastal Free-tailed Bat (*Ozimops cobourgianus*)

The Northern coastal free-tailed bat is a medium sized insectivorous bat species, largely restricted to mangrove forests and adjacent monsoon floodplain forests and woodlands. The species is often recorded roosting in hollows and crevices of mangroves and emerges from roosts relatively early, shortly after sunset, to forage (Van Dyck *et al* 2013, Wilson & Mittermeier, 2019).

Although not listed as a threatened species under state or federal legislation, the Northern coastal free-tailed bat is considered a Priority 1 (P1) species under the WA BC Act 2016. Priority species are considered possible threatened species that do not meet survey criteria or are otherwise data deficient. Priority species are ranked either 1, 2 or 3, arranging each species for survey and evaluation of conservation status (EPA, 2023). Priority 1 are considered poorly known species in need of urgent further survey and status assessment work.

During 2018/19 surveys, APM recorded the species 27 times during surveys in all three habitat type surveyed; rocky outcrops, mid-slope and samphire confirming presence on the project site (APM, 2019). This species is known to roost in grey mangroves, which are likely to be present in the vicinity of King Bay to the west of the project site and also in the northern corner of Hearson's Cove, east of the project site. These mangrove communities are likely the source of any foraging bats detected on site.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Whilst there is a relative dearth of studies relating to light impacts to the Northern coastal free-tailed bat, as with many nocturnal species, artificial lighting may impact foraging regimes and dispersal of many bat species. Artificial lighting can delay feeding by reducing the ability for bats to determine night fall and create light barriers that bats will not cross restricting foraging and dispersal ranges (DCCEEW, 2023).

Foraging Northern free-tailed bats that utilise the area above the project site and adjacent habitat may be impacted by proposed nightworks in the form of light pollution, dust and noise. The species has been confirmed on site and likely roosts in nearby mangrove communities. For these reasons, the residual risk to this species is considered **moderate**. If the mitigations and management recommendations outlined below are adopted this risk may be reduced to **low**.

Mitigation Measures:

- Impose strict speed restrictions of 40km/hr for all site vehicles between dawn and dusk. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species, particularly Pilbara olive python, Northern quoll, Pilbara leaf-nosed bat, Northern coastal free-tailed bat and ghost bat.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Design a night works induction to be delivered to all contractors that will conduct any work on site between dawn and dusk. Information regarding encounters with any of the listed species should be included as well as a stop work procedure if fauna is identified in the works area. Inform any drivers of the potential to encounter threatened species (particularly Pilbara olive python and Northern quoll) whilst driving at night and the importance of observing the speed limit.
- Reduce the use of mesh and barbed wire fences on the project site, limiting the likelihood bats will be impacted by fencing.

Table 8: Residual risk of proposed amendments to Northern coastal free-tailed bat before and after mitigation measures.

Risk Category	Description
Moderate	Northern free-tailed bats occur in the project area and adjacent habitat. Whilst impacts to mangroves where bats likely roost will be avoided, impacts to foraging regimes through noise, light spill and dust may influence a certain number of foraging individuals. A number of mitigation options may reduce this risk rating and lessen the impact on the species.
Low	After applying mitigations.

4.8 Migratory shorebirds

Migratory shorebirds are addressed in the Project Ceres Threatened Species Management Plan that was considered by the WA Environment Protection Authority (EPA). This assessment included the following species:

- Curlew sandpiper (*Calidris ferruginea*) – Critically Endangered (EPBC Act and BC Act),
- Red knot (*Calidris canutus*) – Endangered (EPBC Act and BC Act)
- Great knot (*Calidris tenuirostris*) – Critically Endangered (EPBC Act and BC Act)
- Siberian sand plover (*Anarhynchus mongolus*) – Endangered (EPBC Act and BC Act)
- Bar-tailed godwit (*Limosa lapponica baueri*) – Vulnerable (EPBC Act and BC Act)

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

- Eastern curlew (*Numenius madagascariensis*) – Critically Endangered (EPBC Act and BC Act).

It should be noted, Siberian sand plover was split from Lesser sand plover in October 2023 after the approval was granted (Bird Guides, 2023).

Although not commonly considered a migratory shorebird as such, the Australian fairy tern (*Sternula nereis nereis*) – Vulnerable (EPBC Act and BC Act) is addressed as part of this group. Australian fairy terns, although somewhat migratory, are considered Australian residents and breed in Australia whilst the other listed species are trans-hemispherical migrants breeding in the northern hemisphere during the austral winter.

Australia is geographically and ecologically, an important location for migratory shorebirds within the East Asian–Australasian flyway (the flyway). Thirty-six of the 37 Australian migratory shorebird species breed in the northern hemisphere and migrate annually to southern nonbreeding areas including Australia (DCCEEW, 2017). The flyway stretches from Siberia and Alaska, southwards through east and south-east Asia, to Southern Australia and New Zealand at its southern terminus.

Under the federal "*Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*", important habitat is described as either already been identified as internationally important (RAMSAR etc) or meets the following criteria:

- At least 0.1% of the flyway population of a single migratory shorebird species, or
- At least 2000 migratory shorebirds, or
- At least 15 migratory shorebird species.

None of the species listed were recorded during APM surveys in 2018/19 although potential habitat in the samphire salt marsh supra-littoral area is recorded within and directly adjacent to the project area. The lack of records does not discount the potential occurrence of these species in the future and they have been recorded nearby (Perdaman TSMP, 2022).

Other, more common migratory shorebird species were recorded during APM surveys utilising the supra-littoral zone. These were whimbrel (*Numenius phaeopus*), grey-tailed tattler (*Tringa brevipes*), red-necked stint (*Calidris ruficollis*) Pacific golden plover (*Pluvialis fulva*), and the common greenshank (*Tringa nebularia*). Ruddy turnstone (*Arenaria interpres*) was recorded flying over the project site by GHD in September 2023. Under the guidelines outlined above, the area does not qualify as Nationally Important Habitat, as there are fewer than 15 migratory species, and less than 2,000 migratory shorebirds that regularly use the area (APM 2019).

The samphire flood plain area is, by nature, supra-tidal, meaning it is only inundated due extreme high tides associated with storm events or by drainage from rainfall events. The shorebirds recorded by APM in 2019 were all observed post wet season, when the floodplain substrate is saturated enough to support invertebrate life and subsequent shorebird foraging. The area is considered relatively small in a regional context and limited in its foraging opportunities for shorebirds. Much of the year, the area is dominated by a salty, hard crust limiting any foraging opportunities for shorebirds.

Artificial lighting may impact migratory shorebird's ability to forage in particular areas. Research from New South Wales tracked the movements of double-banded plovers (*Charadrius bicinctus*) through day and night in the Richmond estuary near the regional town of Ballina. This study showed many of individuals responded to the improved light conditions emitted from the town by moving into mudflats that received high amounts of artificial light presumably to aid foraging (Rohweder & Lewis, 2001).

Land reclamation projects impacting migratory shorebird foraging grounds have had significant impacts to the fauna assemblage throughout the flyway (Szabo *et al*, 2016). The proposed construction of the road between the two project sites is through a part of the supratidal zone, albeit the highest point and the least likely to support foraging opportunities for migratory shorebirds. As this zone is not considered important habitat and the area is only available to shorebirds to forage for part of their time whilst in the southern hemisphere, this impact is considered low.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

A 2010 study on the impacts of impulsive noise (noise often emitted by industrial works) on shorebirds, demonstrated a statistically significant positive relationship between the decibel level experienced by the birds and the behavioural response observed, suggesting the louder the noise the greater the behavioural response (Wright, *et al*, 2010). It should be noted that substantial industrial activity currently occurs during night hours on the Burrup peninsula directly adjacent to the salt marsh area, in the form of existing gas and fertiliser plants. Birds that do use the area to forage where possible may be somewhat habituated to the anthropogenic activity nearby.

Given the analysis that the supratidal area adjacent to the site is of relatively low habitat importance to shorebirds and limited occurrences of the species considered in the EPA assessment within the site or habitat adjacent to the site, the risk of the proposed amendments to these species is considered **low**.

A number of mitigation measures outlined below may reduce this risk even further, likely incurring a **negligible** rating.

Mitigation Measures:

- Impose strict speed restrictions of 40km/hr for all site vehicles between dawn and dusk. This is proposed to lessen the likelihood of negative vehicular interactions with threatened species, particularly Pilbara olive python, Northern quoll, Pilbara leaf-nosed bat, Northern coastal free-tailed bat and ghost bat. Reduced speed limits may also reduce impacts of noise on any foraging shorebirds.
- Ensure no light vehicles or personnel conduct works outside of the approved project area.
- Limit artificial light illumination. Minimise the use of artificial lighting to critical tasks. Orientate lights from out to in and use shades to direct light onto work areas while limiting light spill outside the project boundary where possible. Where possible, choose lights which are not bright white LEDs as these cause the most disturbance to nocturnal wildlife.
- Where possible, limit works that produce impulsive noise (loud spontaneous noise – truck and trailer tail gates banging etc), to the dry season or as far away from the supratidal area as possible.
- Where possible, limit works or transit on the proposed road through the supratidal zone to daytime hours during the wet season.

Table 9: Residual risk of proposed amendments to migratory shorebirds before and after mitigation measures

Risk Category	Description
Low	Low likelihood concerned species will occur on or near the project site. Limited foraging opportunities for much of the time these species are in Australia.
Negligible	After applying mitigations.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

5. Results Summary

The following table summarises the status, likelihood of occurrence on the site and residual risk rating for each species or fauna assemblage.

Table 4 Summary of results of assessment of proposed amendment to approval conditions.

Species	Scientific Name	Conservation Status		Potential habitat within or adjacent to project footprint	Recorded during the trapping program	Recorded on site during previous surveys	Likelihood of occurrence pre mitigation	Risk assessment outcome post mitigations
		BC Act	EPBC Act					
Night parrot	*Pezoporus occidentalis*	CE	E	Yes	No	No	Low	Negligible
Northern quoll	*Dasyurus hallicatus*	V	V	Yes	No	No	Moderate	Low
Pilbara olive python	*Liasis olivaceus barroni*	P4	E	Yes	Yes, nearby	No	Moderate	Low
Ghost bat	*Macroderma gigas*	V	V	Yes	Yes, nearby	Yes	Moderate	Low
Pilbara leaf-nosed bat	*Rhinonicteris aurantia*	V	V	Yes	Not surveyed	No	Low	Negligible
Northern coast free-tailed bat	*Ozimops cobourgianus*	P1		Foraging only	Not surveyed	Yes	Moderate	Low
Curlew sandpiper	*Calidris ferruginea*	CE	CE	Foraging only	No	No	Low	Negligible

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Species	Scientific Name	Conservation Status		Potential habitat within or adjacent to project footprint	Recorded during the trapping program	Recorded on site during previous surveys	Likelihood of occurrence pre mitigation	Risk assessment outcome post mitigations
		BC Act	EPBC Act					
Red knot	*Calidris canutus*	E	E	Foraging only	No	No	Low	Negligible
Great knot	*Calidris tenuirostris*	CE	CE	Foraging only	No	No	Low	Negligible
Siberian sand plover	*Anarhynchus mongolus*	E	E	Foraging only	No	No	Low	Negligible
Bar-tailed godwit	*Limosa lapponica baueri*	V	V	Foraging only	No	No	Low	Negligible
Eastern curlew	*Numenius madagascariensis*	CE	CE	Foraging only	No	No	Low	Negligible
Australian fairy tern	*Sternula nereis nereis*	V	V	Foraging only	No	No	Low	Negligible

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Technical Memorandum

6. Conclusion

GHD has assessed a total of 13 threatened and priority fauna species against a proposal to amend the approval conditions for Project Ceres to allow for night works to be conducted and the removal of a machine idling condition. Of the 13 species assessed, a residual risk rating of low and subsequently negligible (after the adoption of recommended mitigation measures), was allocated to nine species. An initial risk rating of moderate was allocated to four species and after the adoption of mitigation measures this rating was reduced to low.

Overall, the proposed amendments present a low risk of potential impacts to the assessed species at a species level. It is GHD's recommendation that the mitigation measures outlined in this document are adopted before the conditions are amended.

Regards,

Nicholas Priest
Senior Ecologist

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

7. References

Armstrong KN & Anstee SD (2000) The ghost bat in the Pilbara: 100 years on.. Australian Mammalogy 22, 93-101.

Australian Museum. Greater Bilby Profile. Date accessed 23 November 2023. Available online at: Greater Bilby - The Australian Museum.

Bat Call WA 2021, A review of ghost bat ecology, threats and survey requirements, report prepared for the Department of Agriculture, Water and the Environment, Canberra. CC BY-NC-ND 4.0.

Biologic Environmental Survey (2019) Western Range Ghost Bat Scat Analysis Report. Report Prepared for Rio Tinto.

Birdlife International (2023) Night Parrot factsheet. Date accessed 22/11/2023. Available online at: Night Parrot (Pezoporus occidentalis) - BirdLife species factsheet.

Cowan, M. (2023) Ghost bat: the phantom of the Australian night sky (cosmosmagazine.com) Date accessed: 29 November 2023.

Cramer, V., K.N. Armstrong, R. Bullen, R. Ellis, L. Gibson, N. McKenzie, M. O'Connell, A. Spate & S. van Leeuwen (2016). Research priorities for the Pilbara leaf-nosed bat (Rhinonicteris aurantia Pilbara form). Australian Mammalogy. http://dx.doi.org/10.1071/AM15012. Available from: http://www.publish.csiro.au/paper/AM15012.htm.

Cramer, VA, Armstrong, KN, Bullen, RD, Cross, SL, Gibson, L, Hanrahan, N, Knuckey, CG, Ottewell, K, Reiffer, S, Ruykys, L, Shaw, RE, Thavornkanlapachai, R, Thompson, SA, Wild, S & Van Leeuwen, S 2022, 'Research priorities for the ghost bat (Macroderma gigas) in the Pilbara region of Western Australia', Australian Mammalogy. https://doi.org/10.1071/AM21042.

Department of Climate Change, Energy, the Environment and Water (2023), Australian Government, accessed 22 November 2023, Threatened Species Strategy 2015- 2020. https://www.dcceew.gov.au/environment/biodiversity/threatened/action-plan/priority-birds/night-parrot

Department of Climate Change, Energy, the Environment and Water (2016), Species Profile and Threats Database, Australian Government, accessed 22 November 2023, Pezoporus occidentalis — Night Parrot (environment.gov.au)

Department of Climate Change, Energy, the Environment and Water (2016), Australian Government. Threatened Species Scientific Committee. Greater Bilby – Conservation Advice. Available online at: 282 - Conservation Advice - 150716 (environment.gov.au).

Department of Climate Change, Energy, the Environment and Water (2016), Species Profile and Threats Database, Australian Government, accessed 22 November 2023, Rhinonicteris aurantia (Pilbara form) — Pilbara Leaf-nosed Bat (environment.gov.au).

Department of Climate Change, Energy, the Environment and Water (2016), Australian Government. EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species.

Department of Climate Change, Energy, the Environment and Water 2023, Australian Government, Australian Government. Northern Quoll. Accessed 21 November 2023. Available online at; Northern Quoll (Dasyurus hallucatus) - DCCEEW.

Gaston, K.J., Davies, T.W., Bennie, J. and Hopkins, J. (2012), REVIEW: Reducing the ecological consequences of night-time light pollution: options and developments. J Appl Ecol, 49: 1256-1266. https://doi.org/10.1111/j.1365-2664.2012.02212.x

Henderson, M. (2015). The Effects of Mining Infrastructure on Northern quoll Movement and Habitat. Honours Thesis. Edith Cowan University.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Ladyman, M. (2019) Animal Plant Mineral (APM). Perdaman Urea Project; Pre and Post wet season Biological Survey, Burrup Peninsula, WA.

Leseberg, Nicholas P., McAllan, Ian A. W., Murphy, Stephen A., Burbidge, Allan H., Joseph Leo, Parker Shane A., Jackett Nigel A., Fuller, Richard A. & Watson, James E. M. (2021) Using anecdotal reports to clarify the distribution and status of a near mythical species: Australia's Night Parrot (Pezoporus occidentalis), Emu - Austral Ornithology, 121:3, 239-249, DOI: 10.1080/01584197.2021.1927760

Longcore, T. and Rich, C. (2004), Ecological light pollution. Frontiers in Ecology and the Environment, 2: 191-198. https://doi.org/10.1890/1540-9295(2004)002[0191:ELP]2.0.CO;2.

Morcombe, M. (2020) Birds of Australia, Digital Edition, Version 1.5. PDA Solutions 2003-2013.

Northover, A., Dziminski, M., Moore, H., Palmer, R., Ottewell, K., Carpenter, F., and Gibson, L., 2023. The Pilbara Bilby (Macrotis lagotis) Research Program: a review of progress (2013-2023). Department of Biodiversity, Conservation and Attractions, Perth.

Pearson, D. (2003). Giant Pythons of the Pilbara. Landscope. 19(1).

Pizzey, G and Knight, F (2020) Birds of Australia, Digital Edition, Version 1.3. Gibbon Mutimedia (Aus) Pty Ltd 2013-2020.

Rohweder, D. A., and Lewis, B. D. (2001). Day–night habitat use by double-banded plovers Charadrius bicinctus in the Richmond River Estuary, northern New South Wales. Corella 26, 33–37.

Stone, E., Jones, G. & Harris, S. (2009) Street Lighting Disturbs Commuting Bats. Current Biology, Vol. 19, Issue 13, Pg. 1123-1127.

Szabo Judit K., Battley Phil F., Buchanan Katherine L., Rogers Danny I. (2016) What does the future hold for shorebirds in the East Asian–Australasian Flyway?. Emu 116, 95-99.

Tutt, M., S. Fekete, S. Mitchell, P. Brace & D. Pearson (2004). Unravelling the mysteries of Pilbara Olive Python ecology. Threatened Species Network Community Grants Final Report- Project WA11/101. Karratha: Nickol Bay Naturalists' Club/WA CaLM.

Tutt,M. S. Mitchell, P. Brace & D. Pearson (2002). Conserving Pilbara olive pythons on the Burrup. Threatened Species Network community grants annual report, Project WA04/100. Karratha: Nickol Bay Naturalists' Club/WA CaLM.

Van Dyck, S., Gynther, I., and Baker, A. (2013). Field Companion to the Mammals of Australia. New Holland Publishers, Sydney.

Wilson D.E. & Mittermeier R.A. (eds.) 2019: Handbook of the Mammals of the World - Vol. 9, Bats. Lynx Editions, Barcelona: 1008 pp., 74 colour plates, more than 450 colour photos, 1423 distribution maps. ISBN: 978-84-16728-19-0.

Wilson, S. & Swan, G. (2017) A Complete Guide to Reptiles of Australia. Fifth Edition, Reed New Holland Publishers. Sydney.

Worley Astron (2006) Pluto LNG Development Desktop Fauna Report. Prepared for Sinclair Knight Merz.

Wright, M, D., Goodman, P. & Cameron, T, C. (2010) Exploring behavioural responses of shorebirds to impulsive noise. Wildfowl, [S.l.], p. 150-167, apr. 2013. ISSN 2052-6458. Available online at: https://wildfowl.wwt.org.uk/index.php/wildfowl/article/view/1230.

This Technical Memorandum is provided as an interim output under our agreement with Clough Group. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

Attachment D - MAC Consultation - 24th Jan 2022

Minutes of Meeting

CONFIDENTIAL

Project:	Project Destiny	**Project No.:**	45826
Purpose:	Stakeholder Engagement	**Meeting No.:**	
Venue:	MAC Office – Burrup	**Date / Time:**	24-Jan-22 @ 10:25

Attendees:

Peter Jeffries (MAC)
Trevena Hick-Phillips
Joan Hicks
Nellie Connors
Raelene Cooper
Brenda Baites
Belinda Churnside (Chair)
Joshua Wescombe
Mary Cosmos
Vince Adams (Left Meeting 10:13am)
Vikas Rambal -Chairman
Ishan Rambal (Perdaman)
Steve Warlow -SCJV
Danny Van Niekerk -SCJV
Simon French-Bluhm -SCJ
Domenic McGinley- SCJV

Distribution: Perdaman, MAC, SCJV

Recorded by: DVN **Signature:** Belinda. Churnside

Belinda. Churnside

Item No.	Description	Action / Date
1.0	Vince Adams Chairperson left the meeting at 10:13am	
2.0	Belinda Churnside as Vice Chairperson agreed to continue the meeting as Chairperson following Vince Adams departure	
1.0	Introductions, overview and general thanks by Vikas Rambal (Chairman of Perdaman) • Perdaman Chairman (VR) opened presentation with an acknowledgement of country and thanked the Murujuga corporation for their time • Vikas Rambal stated that consultation with MAC, the Board & the Circle of Elders, started in Feb 2019 with several engagements, consultation and meetings on site. • VR explained that the presentation will show the Murujuga Board all the hard work and efforts completed by Perdaman and the EPC Contractor to meet the EPA conditions	Note

2.0	Simon French-Blum gave an overview of Environmental Management Plans which have been previously consulted. No technical changes have been made in revised plans. - Flora - Fauna - Threatened Species - Surface Water - Cultural Heritage - Greenhouse Gas MAC Board were provided an overview of each of the above part iv environmental plan updates Simon French-Blum started with the Flora Management Plan making emphasis that the EPA has put strict guidelines to reporting requirements. EPA wanting tangible results in monitoring including additional level of reporting. Peter Jeffries joined the Meeting at 10:36am. **Air Quality Management Plan** - Additional Recommendations have come in from the ministers (base line) and requires independent third-party peer review. Perdaman has 2 years to develop the plan which will be presented to MAC board as required by EPA. Key first step is to identify the key monitoring sites inside and outside site boundary. **Heritage Sites** - Queries about sites for Perdaman plant and relocation of Rock Art. Circle of Elders have agreed to move sites previously. - Section 18 application has been made after the Arc and Ethno surveys were completed and carried out. Murujuga Board and Elders were consulted and negotiated offsets agreed upon. - Conversation on amount have been previously agreed upon p/a for the life of the project. - Initial discussions were had around site avoidance. Further to detail engineering around the plot plan, only 3 sites remained and could not be avoided, the sites were also confirmed to not be Thalu Site. - Uncle Jimmy confirmed to Chair these sites in discussion as per Section 18 come under general artefacts and less significance. - Further meetings with the Circle of Elders will be undertaken to finalise methodology for relocation of identified sites - Scheduled Elders meeting to discuss is scheduled for 31 Jan 2022. - Engagement of MAC Monitors and MAC Rangers ensuring everyone is comfortable prior to works commencing. ACTIONS - Detailed methodology is to be finalised between Perdaman / MAC / Clough and contractors. - Risk Assessments will be developed for each site, specific to each site and location. - Perdaman provided the current work packs to MAC for review prior to future elders meeting scheduled for 31st Jan 2022	Note

Meeting Closed: 12:00

Date of Next Meeting: TBA **Time of Next Meeting:** TBA

Attachment E - Letter to EPA for MAC Consultation on Project Destiny

31st January 2022

Robert Hughes
Environment Protection Authority
Prime House
8 Davidson Terrace, Joondalup
Locked Bag 10, Joondalup DC, WA, 6919

Regulator References:
Department of Water and Environmental Regulation, Part IV Assessment No. ***2184, MS 1705***
Department of Agriculture, Water and the Environment, EPBC Assessment No. ***2018/8383***

Dear Robert,

Re: Perdaman Urea Project – MAC Consultation

I am writing to you on behalf of the Murujuga Aboriginal Corporation (MAC) and its board members regarding the Perdaman Urea Project (the Project).

On the 24th January 2022, Perdaman and its EPC Contractors comprising Saipem and Clough, visited the MAC offices to present a series of management plans to myself and the MAC Board. The presentation commenced by revisiting the previous consultations undertook by Perdaman over the past four years and was presented by the Perdaman Chairman, Mr Vikas Rambal.

The following Environmental Management Plans were presented in three sessions during this consultation:

1. Flora Management Plan;
2. Surface Water Management Plan;
3. Greenhouse Gas Management Plan;
4. Fauna and Threatened Species Management Plan;
5. Light Management Plan; and,
6. Cultural Heritage Management Plan

The MAC Board were also offered a discussion opportunity for each Plan and minutes were recorded by the EPC Contractors representative. The minutes were distributed after the meeting to myself and the MAC board and is considered a true and accurate record of the meeting.

The MAC Board were also offered a discussion opportunity for each Plan and minutes were recorded by the EPC Contractors representative. The minutes were distributed after the meeting to myself and the MAC board and is considered a true and accurate record of the meeting.

The CHMP presentation highlighted the proposed salvage and relocation works of three Heritage sites in accordance with the Section 18 AHA application; comprising site ID: #18615, #19239 and #19874.

On the 28th January 2022, Perdaman was provided notice that consent (with conditions) under *Section 18(3) Aboriginal Heritage Act 1972* was granted.

Conditions applied to the consent requires Perdaman to develop the Cultural Heritage Management Plan (CHMP) in consultation with MAC Heritage and Rangers and be endorsed by myself and Circle of Elders.

On the 31st January 2022, Perdaman with its EPC contractors once again visited MAC to present to myself and Circle of Elders to gain endorsement of the CHMP and more specifically the salvage and relocation proposal.

The Circle of Elders and myself endorse the amended CHMP and Salvage and Relocation methodology.

Yours sincerely,

Peter Jeffries
Chief Executive Officer
MURUJUGA ABORIGINAL CORPORATION

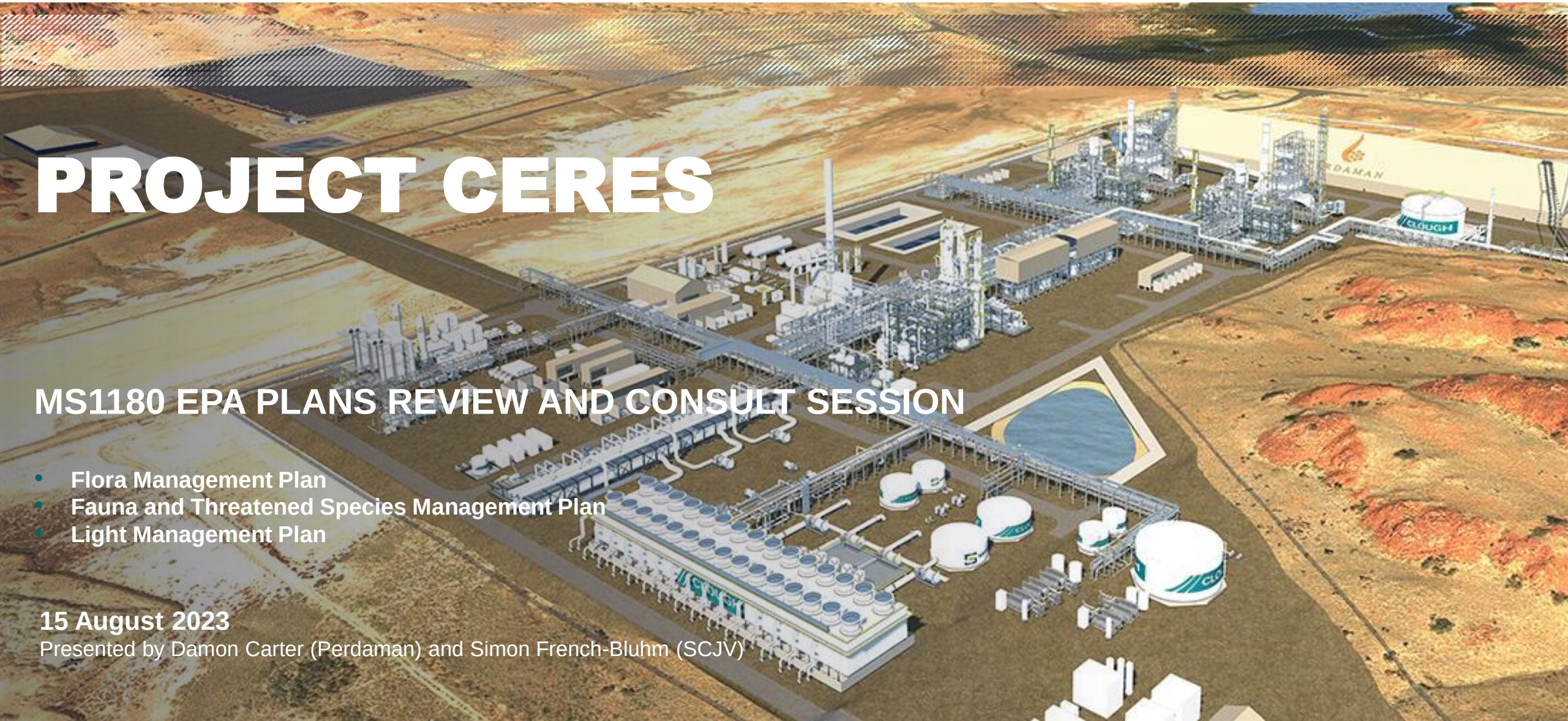
Copy: Hon Dr Tony Buti MLA, Minister for Aboriginal Affairs
Vikas Rambal, Perdaman

Attachment F - MAC Consultation – August 2023

PERDAMAN

SAIPEM clough

SCJV



PROJECT CERES

MS1180 EPA PLANS REVIEW AND CONSULT SESSION

- Flora Management Plan
- Fauna and Threatened Species Management Plan
- Light Management Plan

15 August 2023

Presented by Damon Carter (Perdaman) and Simon French-Bluhm (SCJV)

ACKNOWLEDGEMENT OF COUNTRY

"We would like to acknowledge and pay respect to the elders who are here today, members of the Murujuga Aboriginal Corporation, to acknowledge those who have passed before us and to acknowledge the members of the Aboriginal community and the traditional custodians of this Murujuga land and sea."

PERDAMAN

SAIPEM clough SCJV

PART IV EPA REQUIRMENTS

CONTEXT & SCOPE

- Project has obtained all Federal and State Environmental Approvals. EPBC 2018/8383 and Ministerial Statement 1180.
- **MS1180** requires the proponent to Consult with MAC on several Plans.
- Purpose of this presentations is to meet the ministerial conditions and include a record of the presentation, meeting and discussion points in each of the required plans.
- Ongoing requirement in the Ministerial Statement to continually consult with MAC when revising plans.

REVIEWS REQUIRING MAC CONSULTATION

Flora

Fauna

Threatened Species

Lighting

Cultural Heritage

Surface Water

Greenhouse Gas

Consult, Presented on 15 Aug 23

Consult, Planned for 29 Aug 23

PERDAMAN

SAIPEM clough

SCJV

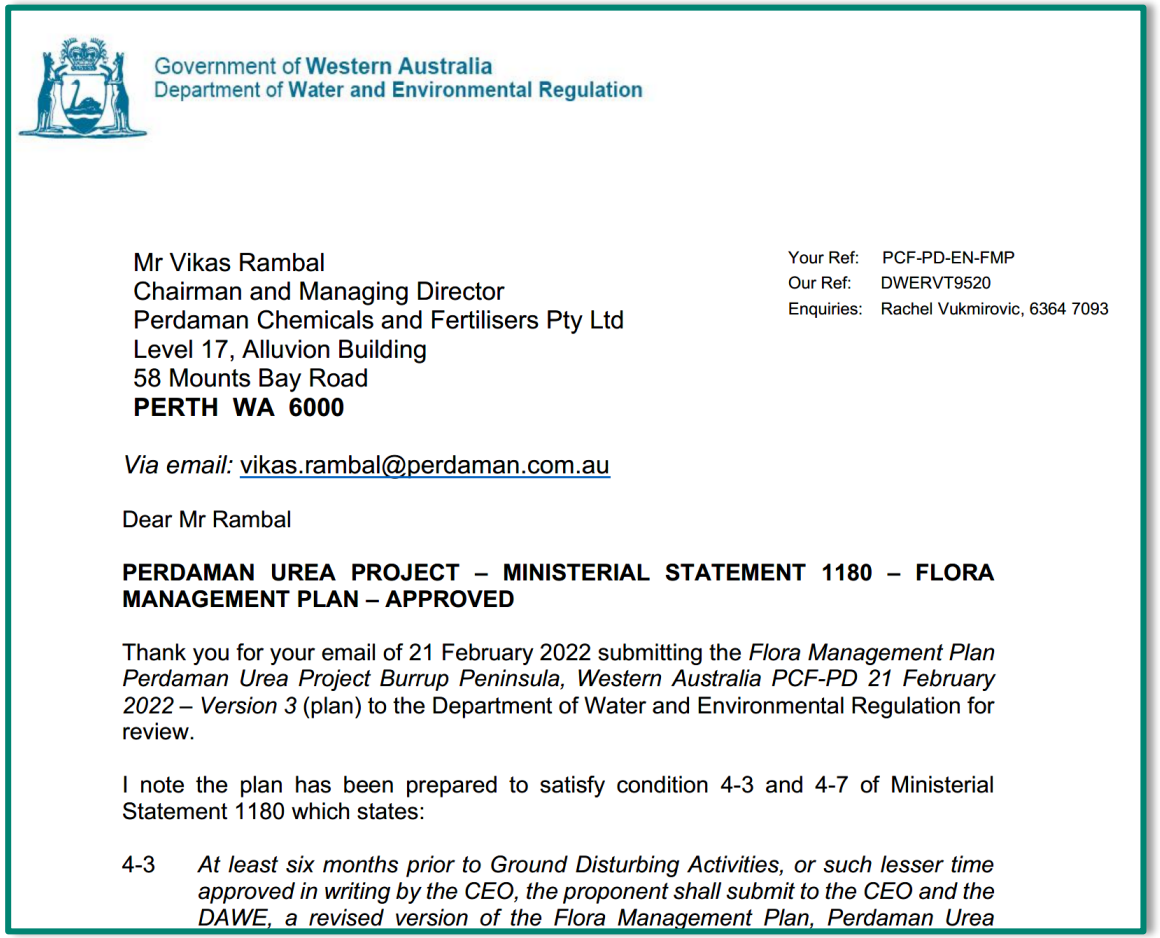
FLORA MANAGEMENT PLAN

CONTEXT

- This plan was prepared during approval process in consultation with MAC prior EPA approval dated April 2021.
- EPC Contractor updated this plan with the latest requirement of EPA and Minister conditions imposed on the project.
- EPC Contractor presented reviewed plan to MAC on 24 January 2022 with no Technical Changes.
- Rev 03 of the Flora Plan was submitted to EPA for approval on 21 February 2022.
- The Flora Management Plan was approved by EPA on the 11 March 22.

OBJECTIVE

- Perdaman has conducted a review of the FMP.
- Perdaman is to consult and communicate **Key Aspects** of the revised plan with MAC.



Government of **Western Australia**
Department of **Water and Environmental Regulation**

Mr Vikas Rambal
Chairman and Managing Director
Perdaman Chemicals and Fertilisers Pty Ltd
Level 17, Alluvion Building
58 Mounts Bay Road
PERTH WA 6000

Your Ref: PCF-PD-EN-FMP
Our Ref: DWERVT9520
Enquiries: Rachel Vukmirovic, 6364 7093

Via email: vikas.rambal@perdaman.com.au

Dear Mr Rambal

PERDAMAN UREA PROJECT – MINISTERIAL STATEMENT 1180 – FLORA MANAGEMENT PLAN – APPROVED

Thank you for your email of 21 February 2022 submitting the *Flora Management Plan Perdaman Urea Project Burrup Peninsula, Western Australia PCF-PD 21 February 2022 – Version 3* (plan) to the Department of Water and Environmental Regulation for review.

I note the plan has been prepared to satisfy condition 4-3 and 4-7 of Ministerial Statement 1180 which states:

4-3 *At least six months prior to Ground Disturbing Activities, or such lesser time approved in writing by the CEO, the proponent shall submit to the CEO and the DAWE, a revised version of the Flora Management Plan, Perdaman Urea*

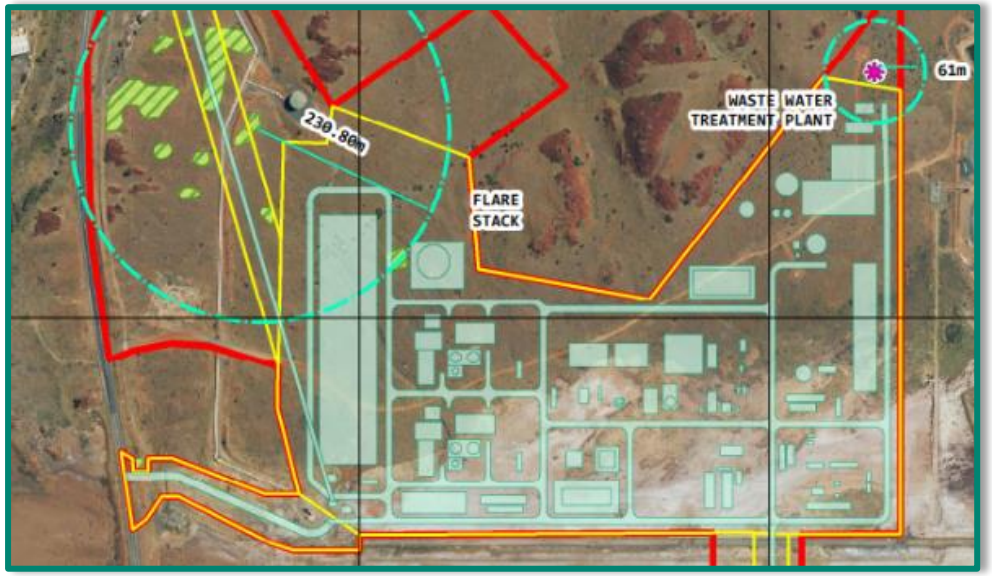
PERDAMAN

SAIPEM clough SCJV

FLORA MANAGEMENT PLAN

KEY CHANGES IN THIS PLAN AND ASSOCIATED ACTIVITIES

- **NO** Technical Changes since March 2021.
- EPA require traditional owners to be invited to observe **Ground Disturbing Activities**
- Coffey Conducted Baseline Weed Survey in November 2022.
- Trace Ecology conducted Ecological Survey including updating baseline flora transect and weeds in June 2023.
- Identified further areas of degradation and impact.



SAIPEM CLOUGH
SCJV

Peter Jeffries
Murujuga Aboriginal Corporation
313 King Bay Road
Dampier, WA, 6713
P. O. Box 1544, Karratha, 6714, WA

Level 9, 58 Mounts Bay Road
Perth Western Australia 6000
T: +61 8 9281 9281
E: clough@clough.com.au
www.clough.com.au

Regulator References: 80-03704
Section 18(3) Aboriginal Heritage Act 1972, Condition 2

04 February 2022

Dear Peter,

Re: Perdaman Urea Project – Section 18(3) Cultural Heritage Approvals – Condition 2

It's been a pleasure dealing with you and your team over the last few months and the recent meetings at you offices, in respect of those discussion and the recent Section 18 approval.

I am writing to you with regards to Condition 2 from the recent Section 18 consent for the Perdaman Urea Project (the Project).

The EPC Contractor (comprising Saipem and Clough) are inviting MAC representatives as per the condition stated below.

The consent holder: "Invites in writing, giving 30 days' notice for two Murujuga Aboriginal Corporation (MAC) representatives from each of the five groups, Ngarluma, Yindjibarndi, Mardudhunera, Wong-Goo-Tt-Oo and Yaburara, to be present for ground disturbing works on the Land where it intersects with Aboriginal sites".

Could MAC please provide Perdaman and the EPC Contractor with the names of the nominated personnel so that we may forward these to our Project Team to include their involvement with regards to Ground Disturbing Activities on Land where it intersects with Aboriginal Sites.

Yours sincerely,

Steve Warlow

Steve Warlow
Deputy Project Director

Copied: Vikas Rambal – Perdaman Chairman

PERDAMAN

SAIPEM clough
SCJV

HOW WILL WE COMPLY?

Step 1

- Survey Clearing Boundary
- Survey Early warning Boundary (0.5m inside the site clearing boundary).
- Survey P1 PEC Communities

Step 2

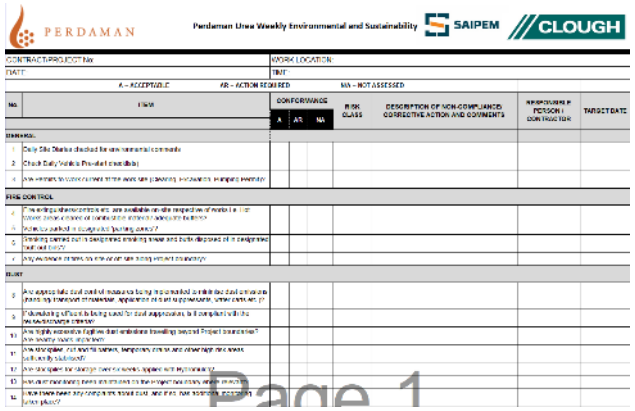
- Pink Survey Flag = Clearing Boundary
- White Flag = Early warning indicator Boundary
- Pink & Black = Heritage and P1 PEC

Step 3

- Install temporary star picket fence along Clearing Boundary and where required remove Pink Survey marker only.

Step 4

- Inspect temporary fence line and survey markers weekly during construction for EPA compliance.

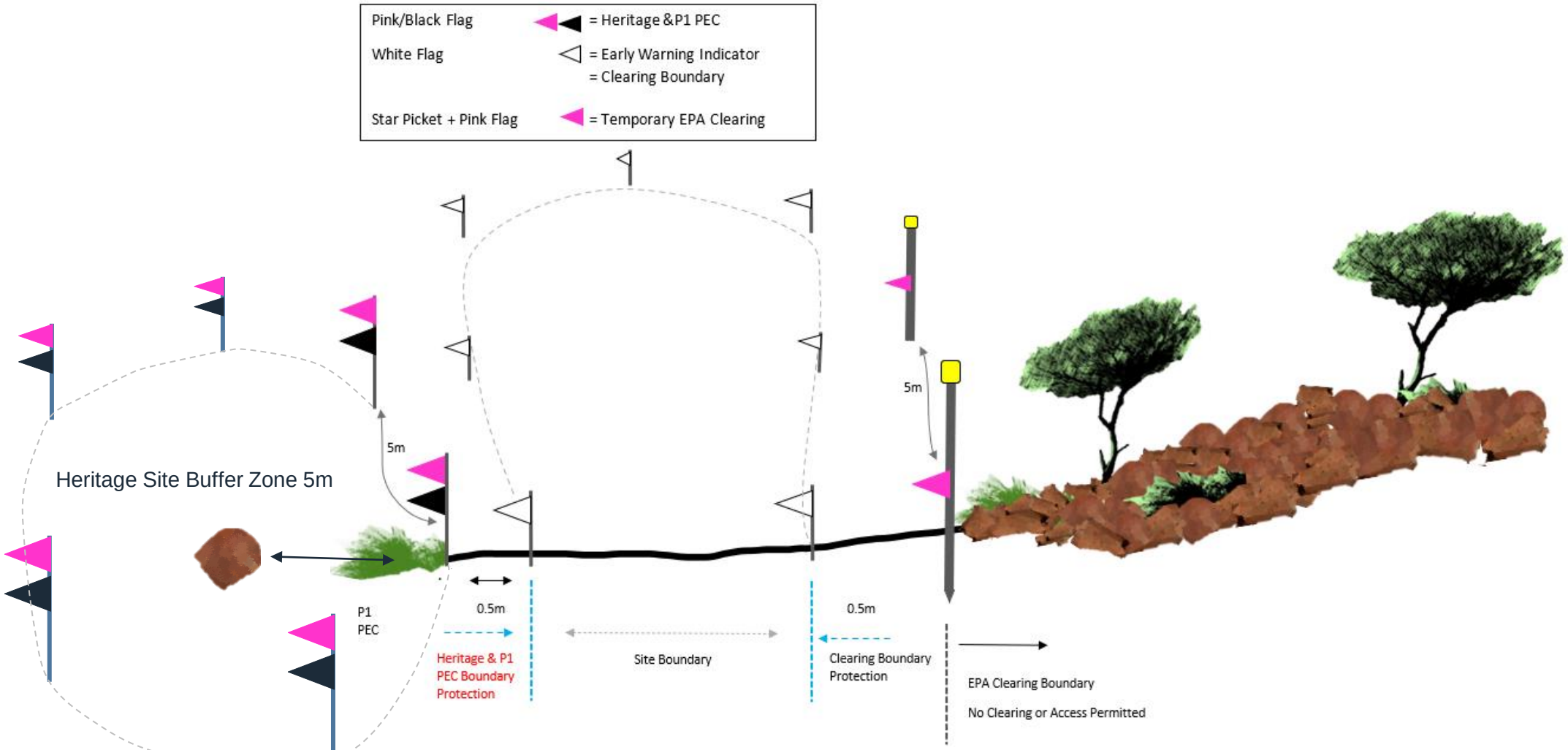


PERDAMAN

SAIPEM clough

SCJV

Survey and Clearing Boundary Sketch



FAUNA & THREATENED SPECIES MANAGEMENT PLANS

CONTEXT

- This plan was prepared during approval process in consultation with MAC prior EPA approval dated April 2021.
- EPC Contractor updated this plan with the latest requirement of EPA and Minister conditions imposed on the project.
- EPC Contractor presented reviewed plan to MAC on 24 January 2022 with no Technical Changes.
- Rev 04 of the Fauna Management Plan (FaMP) was submitted to EPA for approval on 12 May 2022.
- The Fauna Management Plan was approved by EPA on the 07 July 2022.

OBJECTIVE

- Perdaman has conducted a review of the FaMP.
- Perdaman is to consult and communicate **Key Aspects** of the revised plan with MAC.

Government of Western Australia
Department of Water and Environmental Regulation

Your Ref: PCF-PD-EN-FaMP
Our Ref: DWERVT9574
Enquiries: Mark Rust, Ph (08) 6364 6702

Mr Vikas Rambal
Chairman and Managing Director
Perdaman Chemicals and Fertilisers Pty Ltd
Level 17, Alluvion Building, 58 Mounts Bay Road
PERTH WA 6000

Via email: Vikas.Rambal@perdaman.com.au

Dear Mr Rambal

PERDAMAN UREA PROJECT – MINISTERIAL STATEMENT 1180 – FAUNA MANAGEMENT PLAN – APPROVED

Thank you for submitting the Fauna Management Plan Perdaman Urea Project Burrup Peninsula, Western Australia PCF-PD-EN-FaMP (12 May 2022, Rev PCF 4) to the Department of Water and Environmental Regulation for review.

I note that the Fauna Management Plan has been prepared to satisfy Condition 5 of Ministerial Statement 1180.

I am satisfied that the Fauna Management Plan Perdaman Urea Project Burrup Peninsula, Western Australia PCF-PD-EN-FaMP (12 May 2022, Rev PCF 4) meets the requirements of Condition 5 of Ministerial Statement 1180. The proponent must now implement the provisions of the plan as required by Condition 5-5 of Ministerial Statement 1180.

If you have any queries on the above information, please contact Mark Rust on (08) 6364 6702.

PERDAMAN

SAIPEM clough
SCJV

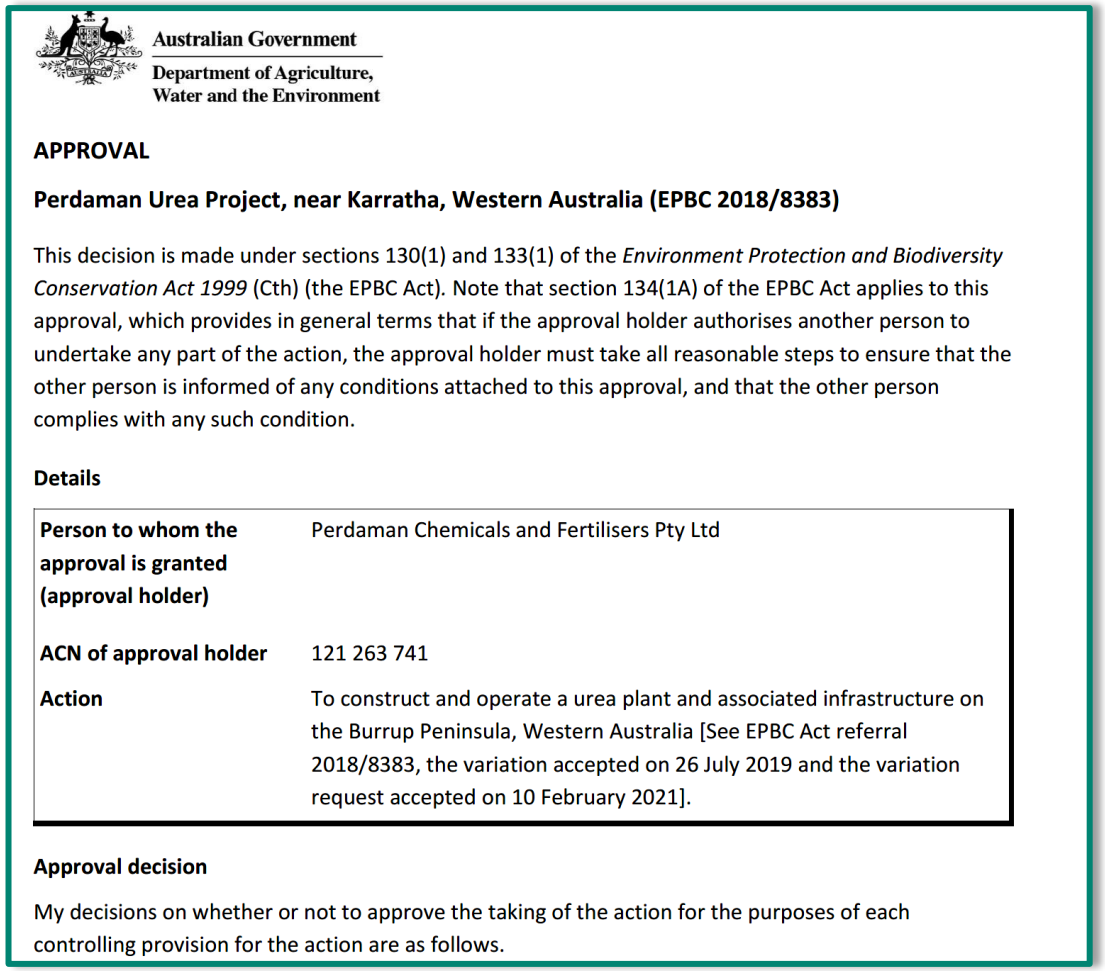
FAUNA & THREATENED SPECIES MANAGEMENT PLANS

CONTEXT

- This plan was prepared during approval process in consultation with MAC prior DCCEEW approval dated April 2021.
- EPC Contractor updated this plan with the latest requirement of EPA, DCCEEW and Minister conditions imposed on the project.
- EPC Contractor presented reviewed plan to MAC on 24 January 2022 with no Technical Changes.
- Rev 05 of the Threatened Species Plan (TSMP) was submitted to DCCEEW for approval on 01 February 2022.
- The Threatened Species Plan was approved by DCCEEW on the 07 July 2022.

OBJECTIVE

- Perdaman has conducted a review of the TSMP.
- Perdaman is to consult and communicate **Key Aspects** of the revised plan with MAC.



Australian Government
Department of Agriculture, Water and the Environment

APPROVAL

Perdaman Urea Project, near Karratha, Western Australia (EPBC 2018/8383)

This decision is made under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (the EPBC Act). Note that section 134(1A) of the EPBC Act applies to this approval, which provides in general terms that if the approval holder authorises another person to undertake any part of the action, the approval holder must take all reasonable steps to ensure that the other person is informed of any conditions attached to this approval, and that the other person complies with any such condition.

Details

Person to whom the approval is granted (approval holder)	Perdaman Chemicals and Fertilisers Pty Ltd
ACN of approval holder	121 263 741
Action	To construct and operate a urea plant and associated infrastructure on the Burrup Peninsula, Western Australia [See EPBC Act referral 2018/8383, the variation accepted on 26 July 2019 and the variation request accepted on 10 February 2021].

Approval decision

My decisions on whether or not to approve the taking of the action for the purposes of each controlling provision for the action are as follows.

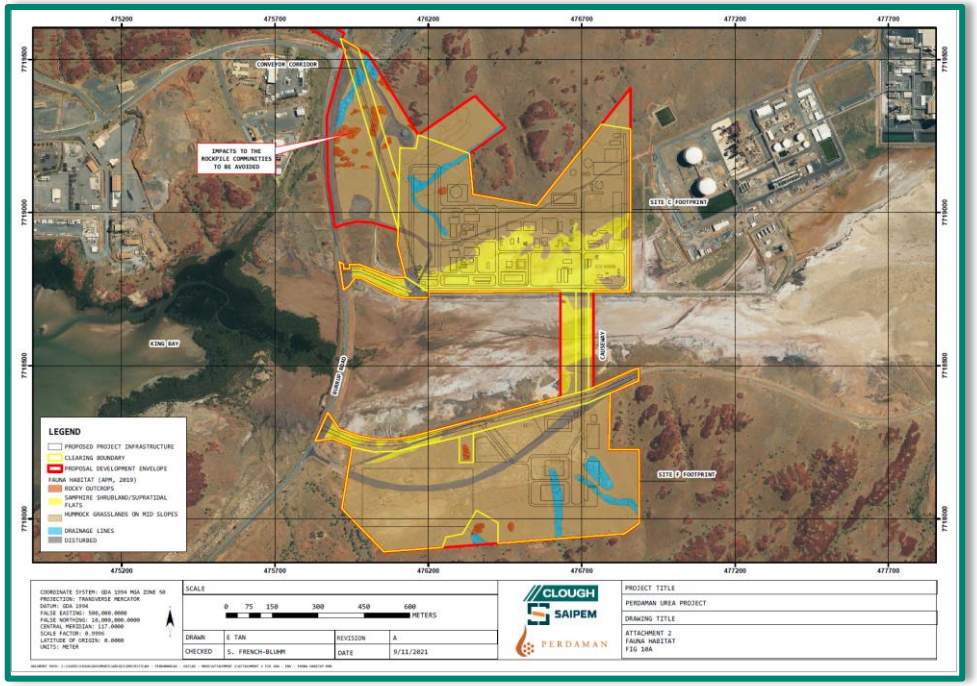
PERDAMAN

SAIPEM clough SCJV

FAUNA & THREATENED SPECIES MANAGEMENT PLANS

KEY CHANGES IN THIS PLAN AND ASSOCIATED ACTIVITIES

- **NO** Key Technical Changes since March 2021.
- Bennelongia Conducted a Short Range Endemic Survey of the Rock Piles between January and May 2022.
- EPC Contractor opted to conduct a trapping and translocation program for Threatened Species.
- Fauna Habitat reassessed and mapped by Trace Ecology in July 2023.
- Trace Ecology commenced trapping and translocation in July 2023 for Main Roads Hearson Cove Road Realignment.
- Trace Ecology conducted Ecological Survey including updating baseline flora transect and weeds in June 2023.
- Threatened species have not been identified on site nor trapped to date (14 nights of trapping).
- Fauna interactions are logged on the SCJV Fauna interaction register available online through FieldMaps.



PERDAMAN

SAIPEM clough SCJV

MANAGING IMPACTS TO FAUNA & THREATENED SPECIES

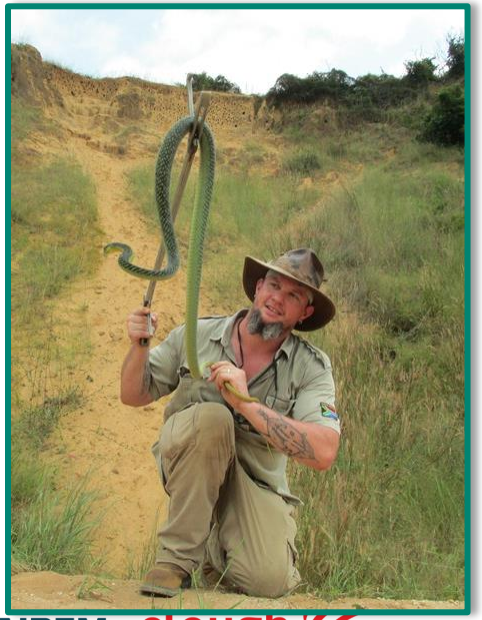
To comply with the requirement to minimise direct and indirect impacts to the northern quoll, Pilbara olive python and the ghost bat the following has been addressed in the Fauna Plans

- **Clearing Boundary** fencing will act as “No-Go-Zone” fencing to control access to protected fauna habitat.
- Using **mesh style fences** on site during or following construction instead of fences that use horizontal wire strands or barbed wire to minimise the potential for impacts on ghost bats.
- **Management Actions** have been developed in the Plan which aim to avoid impacts to Pilbara Olive Python and other native fauna, avoiding creek line impacts which is used by the Ghost Bat, maintain denning habitat, encourage reinstatement of microhabitat elements, installing drainage and erosion to protect water quality & proper waste storage.
- Manage **noise and vibration & dust impacts** (i.e., watercarts for dust suppression, vehicles, equipment, plant fitted with noise attenuation devices, monitoring as required, noisy or vibratory activities to occur during daytime hours where possible.
- Designated roads and tracks will be sign posted and **speed limits** enforced to reduce vehicle strike potential.

PERDAMAN SAIPEM CLOUGH

MANAGING IMPACTS TO FAUNA & THREATENED SPECIES

- **Educating Personnel** of native and threatened species onsite and within surrounding habitat, no-go zones and reporting protocols.
- **Excavations & trenches** shall be monitored, fauna handled, removed & relocated by qualified and licensed fauna-handlers.
- **Monitoring** of onsite storage ponds and stormwater holding ponds.
- **Rehabilitation** of habitats.
- The causeway (between sites C and F) on the tidal flats will contain large culverts to maintain hydrological and tidal flows and allow fauna to freely move through the structure.
- **Design plant lighting** in accordance *Outdoor Lighting Guidelines*, placing light shields on large equipment to minimise light overspill, and using minimum wattage lighting in the plant where possible.
- Implementation of the Pest Management Plan to help manage and control pests and introduced species to land and storage ponds.



PERDAMAN

SAIPEM clough SCJV

HOW WILL WE COMPLY?

Step 1
- **Completed Short-Range Endemic Fauna Survey as per EPA requirements**
- **December 2021 – March 2022.**

Step 2
- Survey Clearing Boundary
- Survey Early warning Boundary (0.5m inside the site clearing boundary).
- Survey Fauna Habitat to be protected.

Step 3
- Install temporary star picket fence along Clearing Boundary (that will act as a “No-Go-Zone” for the Fauna Habitat to be protected)

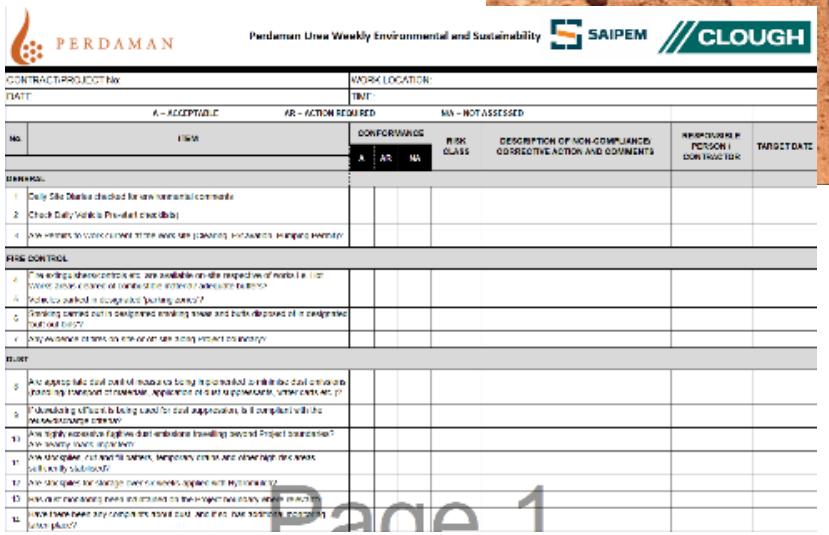
Step 4
- Install fauna egress in applicable trenches, excavations and storage ponds onsite for trenches and excavations open for >12hrs.

Step 5
- Install speed limit signage & construct designated roadways / access routes.

Step 6
- Inspect temporary fence line and survey markers weekly during construction for EPA compliance.

Step 7
- Carry out morning trench inspections (within 3 hours of sunrise) & fauna capture / relocation.
- Carry out fauna inspections, capture, removal and relocation prior to clearing.
- Carry out trench / excavation inspections prior to rain events.

Step 8
- Maintain fauna interaction Register


PERDAMAN
Perdaman Urea Weekly Environmental and Sustainability
SAIPEM
CLOUGH
Page 1

PERDAMAN
SAIPEM
CLOUGH

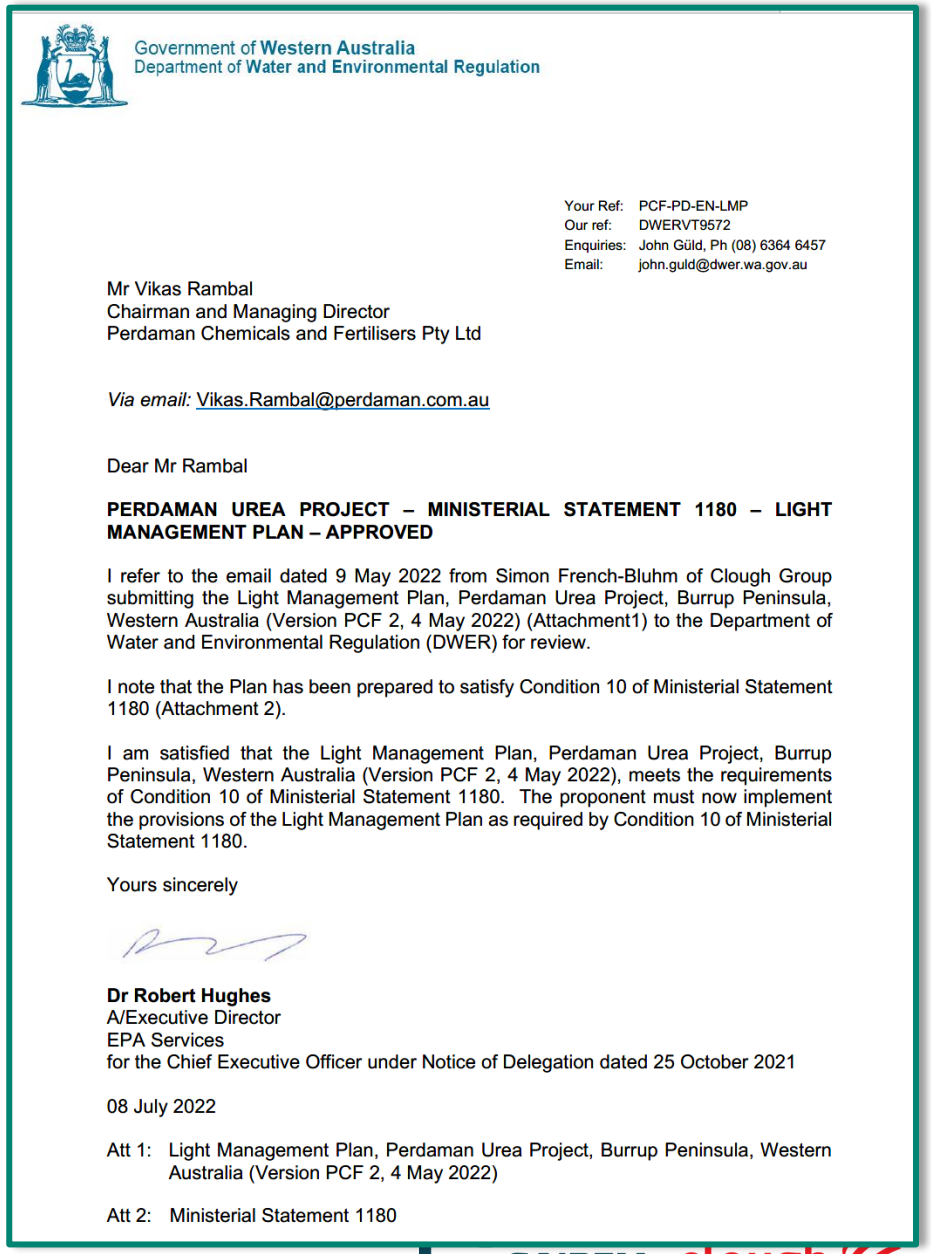
LIGHTING MANAGEMENT PLAN

CONTEXT

- The Light Management Plan is a new plan required by the EPA within MS 1180.
- This Plan addressed Night Glow and impacts to Heritage Values, rather than impacts to Marine Fauna.
- Lighting from the Project will add to the existing night glow on Hearson Cove and Deep Gorge (Ngajarli), and has the potential to impact on the experience of night visits to these locations.
- EPC Contractor prepared the plan with the support of Pendoley and submitted Rev 02 to EPA on 4 May 2022.
- Rev 02 of the Light Management Plan was approved by EPA on the 08 July 2022.

OBJECTIVE

- Perdaman has conducted a review of the FMP.
- Perdaman is to consult and communicate **Key Aspects** of the revised plan with MAC.



Government of Western Australia
Department of Water and Environmental Regulation

Your Ref: PCF-PD-EN-LMP
Our ref: DWERVT9572
Enquiries: John Güld, Ph (08) 6364 6457
Email: john.guld@dwer.wa.gov.au

Mr Vikas Rambal
Chairman and Managing Director
Perdaman Chemicals and Fertilisers Pty Ltd

Via email: Vikas.Rambal@perdaman.com.au

Dear Mr Rambal

PERDAMAN UREA PROJECT – MINISTERIAL STATEMENT 1180 – LIGHT MANAGEMENT PLAN – APPROVED

I refer to the email dated 9 May 2022 from Simon French-Bluhm of Clough Group submitting the Light Management Plan, Perdaman Urea Project, Burrup Peninsula, Western Australia (Version PCF 2, 4 May 2022) (Attachment1) to the Department of Water and Environmental Regulation (DWER) for review.

I note that the Plan has been prepared to satisfy Condition 10 of Ministerial Statement 1180 (Attachment 2).

I am satisfied that the Light Management Plan, Perdaman Urea Project, Burrup Peninsula, Western Australia (Version PCF 2, 4 May 2022), meets the requirements of Condition 10 of Ministerial Statement 1180. The proponent must now implement the provisions of the Light Management Plan as required by Condition 10 of Ministerial Statement 1180.

Yours sincerely

Dr Robert Hughes
A/Executive Director
EPA Services
for the Chief Executive Officer under Notice of Delegation dated 25 October 2021

08 July 2022

Att 1: Light Management Plan, Perdaman Urea Project, Burrup Peninsula, Western Australia (Version PCF 2, 4 May 2022)

Att 2: Ministerial Statement 1180

PERDAMAN

SAIPEM clough
SCJV

LIGHTING ASPECTS

To achieve the EPA objective:

- **Best Practice technology** and **risk based management actions** has been proposed demonstrate compliance with the Objective and minimise night glow.
- The Plan has set out **measurable targets** to determine the effectiveness of management actions and light technology.
- The Plan has specified **monitoring** to measure the effectiveness of light technology and the management actions against the targets.
- The Plan established **reporting** requirements as well as consultation requirements.

PERDAMAN

SAIPEM clough SCJV

APPROACH

- Pendoley (Consultant) engaged to assess, investigate and address management actions in the approved **Light Management Plan**.
- Part 1 – Prepare Light Management Plan using best practice – Completed and Approved
- Phase 1 – Conduct benchmark ALAN Survey – Completed
- Phase 2 – Prepare Artificial Lighting Model - Planned November 2023.
- Phase 3 – Revise Light Plan with MAC Consultation as per Ministerial Statement 1180 – June 2024.

PERDAMAN

SAIPEM clough SCJV

Attachment G - MAC Consultation – 8 January 2024

MINUTES OF MEETING

MEETING No	MLM-03	**LOCATION**	MAC OFFICE
CONTRACT No	45826	**PROJECT**	Project CERES
CONTRACT TITLE	Perdaman Urea	**DATE**	08/01/2024
MEETING PURPOSE	External	**CONTRACTOR**	SCJV
TIME START	2:00PM	**TIME FINISH**	3:00PM

MAC Monthly Liaison Meeting

Names of Attendees	Organisation	Function	Initials
Kim Wood	MAC	CEO	KW
Vince Adams	MAC	Vice Chair	VA
Amy Stevens	MAC	Heritage Manager	AS
Damon Carter	Perdaman	Environmental and Heritage Manager	DCa
Vikas Rambal	Perdaman	PCF Chairman	VR
John Guyer	SCJV	Project Director - PIC	JG
Nick Fabriziani	SCJV	Heritage and Indigenous Manager	NF
David Cunnington	SCJV	Construction Manager	DCu
Audrius Gudeika	SCJV	Deputy HSSE Manager	AG
Kelly Luskan	SCJV	Community and Stakeholder Manager	KL
Names of Apologies	Organisation	Position	Initials
Peter Hicks	MAC	MAC Chairman	PH
Peter Cooper	MAC	Ranger Co-Ordinator	PC
Simon French-Bluhm	SCJV	Environmental Manager	SFB

DISTRIBUTION – All attendees and apologies

Note: Missing subject item numbers relate to items that have been closed out in previous minutes. For record of previously closed items please refer to archived minutes of meeting records.

Subject Item	Description of Discussion	Date Raised	Action by	Date Req'd
1.0	**Welcome and Review of Previous Minutes**			
1.1	VR – General discussion about the project's successful engagement to date with the Local indigenous businesses.		NOTE	
1.2	VR noted there will be upcoming business opportunities.		NOTE	
1.3	Biparn have now commenced security of the site.		NOTE	
2.0	**Project Update**			
2.1	JG – Updated on the project status. • Month 9 of the project • 14% overall complete • 42% engineering complete • Construction - 122 days on site • Zero injuries • 9 more work packages put out to tender. • 25% procurement completed. • Staying compliant • Awarded TOLL warehouse/laydown facility. • Fabrication yard – Chennai – first weld end of February 2024		NOTE	
3.0	**Cultural Heritage Activities**			
3.1	Still utilising monitors for blasting activities		NOTE	
4.0	**Complaints or Grievances**			
4.1	Nil			
5.0	**Other Business**			
3.1	DCa – Presented to MAC the outcomes of the management plan annual review concluding there were no material changes and management actions and commitments remain unchanged for plans including: • Flora Management Plan • Fauna Management Plan • Cultural Heritage Management Plan • Surface Water management Plan • Greenhaouse Gas Management Plan • Light Management Plan Threatened Species Management Plan has been revised with minor amendments made to management action 9 (to allow construction night works), and management action 14 (to remove the need to idle machines for 30 mins prior to working.		NOTE	

3.2	No comments from MAC on the reviewed plans or revised TSMP. DCa noted the presentation slides would be attached to the minutes for information and that MAC can forward any questions directly		NOTE	

NEXT MEETING:	5 February 2024	
	NAME	**POSITION**
MINUTES RECORDED BY	Kelly Luskan	Community and Stakeholder Manager
ATTACHED TO THESE MOM		
1. Management Plan Review Presentation		

PERDAMAN

SAIPEM clough SCJV

PROJECT CERES

MANAGEMENT PLAN REVIEW

2023

MS1180 EPA PLANS REVIEW AND CONSULT SESSION

08 January 2023
Presented by Damon Carter (Perdaman)

Management Plan Review – Annual Reviews 2023

- All Confirmed Management Plans contain a commitment to review the Plans at least annually.
- Reviews commenced in July 2023.
- Reviews conducted on:
    - Fauna Management Plan
    - Flora Management Plan
    - Surface Water Management Plan
    - Cultural Heritage Management Plan
    - Greenhouse Gas Emissions Management Plan
    - Light Management Plan
- Revised Threatened Species Management Plan prepared for regulatory approval to allow for changes to Management Actions and associated approvals.

Summary of Changes to all Management Plans

- Updated to reflect current regulatory requirements:
    - Ministerial Statement 1180 - reporting clarified
    - EPBC20185/8383 - reporting clarified
    - Biodiversity Conservation Act – all S40 requirements added
    - Biodiversity Conservation Regulation 28 – all requirements added
    - Rights in Water and Irrigation Act - all requirements added
    - Aboriginal Heritage Act – S18 consent
- Updated justification, roles and responsibilities, Environmental Values to ensure consistency with Environmental Review Document, approvals and Management Plans (including Contractor Construction Environmental Management Plan)
- Updated Stakeholder Engagement information to reflect past Management Plan consultations.
- Attachments and Appendices updated/corrected.
- Cross referencing updated
- Spelling and grammar, repetition, sense checking.

Flora Management Plan

- No technical changes
- No changes to Management Actions
- Commitments unchanged from EPA approved plan February 2022

Fauna Management Plan

- No technical changes
- No changes to Management Actions
- Commitments unchanged from EPA approved plan May 2022
- Added outcomes of pre-clearance survey

Surface Water Management Plan

- No technical changes
- No changes to Management Actions
- Commitments unchanged from EPA approved plan May 2022

Cultural Heritage Management Plan

- Full and Redacted versions prepared
- No technical changes
- No changes to Management Actions
- Commitments unchanged from EPA approved plan May 2022

Greenhouse Gas Emissions Management Plan

- No technical changes
- No changes to Management Actions
- Commitments unchanged from EPA approved plan March 2022

Light Management Plan

- Removed reference to protection of Fauna – this is addressed in the Fauna Management Plan and Threatened Species Management Plan
- No changes to Management Actions
- Commitments unchanged from EPA approved plan May 2022

Threatened Species Management Plan

- CHANGES TO MANAGEMENT ACTIONS
  - Management Action 9

    ORIGINAL

    “Construction and/or clearing within the development envelope will only occur in daylight hours to minimise noise, vibration and artificial lighting impacts on terrestrial fauna.”

    CHANGED

    “Clearing within the development envelope will only occur in daylight hours to minimise noise, vibration and artificial lighting impacts on threatened terrestrial fauna.”

    Triggers and Contingency Actions changed.

Threatened Species Management Plan

- MANAGEMENT ACTION 9

Justification for change

- Contractor requires night shifts for earthworks, civils and commissioning of the plant
- Commencing in May 2024

Limiting Factor

- Biodiversity Conservation Act Management Operation S40 Approval limits construction work to daytime hours only:
    - To avoid or minimise adverse impacts to the above listed threatened species, the proponent will undertake the following:

      …

      (2) During clearing and construction activities the proponent will undertake the following actions:

      (a) clearing and construction activities will only occur during daylight hours

- Department of Biodiversity, Conservation and Attractions (Species and Communities) based the approval off the Confirmed Threatened Species Management Plan approved by EPA and DCCEEW in February 2022

Threatened Species Management Plan

- MANAGEMENT ACTION 9

Amendment Request

- Species and Communities advised an amendment to the S40 approval can be made if Perdaman provides an assessment of the level of risk to threatened fauna posed by nightworks.
- Species and Communities will review the risk assessment.
- An Amendment to Authorisation to take or disturb threatened species will be drafted and provided to the Minister's Delegate for review.

Ecological Risk Assessment

- Perdaman engaged GHD Senior Ecologist to review information and assess the risk to threatened species (and conservation significant species and migratory birds) from night works.

Threatened Species Management Plan

- CHANGES TO MANAGEMENT ACTIONS
    - Management Action 14

      ORIGINAL
      “Machinery will idle for at least 30 mins, prior to the commencement of vegetation clearing activities.”

      CHANGED
      Deleted

Threatened Species Management Plan

- MANAGEMENT ACTION 14

Justification for change

- Idling causes increase in fuel use and greenhouse gas emissions.
- Equates to unproductive hours on the equipment.
- No information found to support the assumption that idling machinery for 30 minutes benefits fauna.
- The Contractors Construction Environmental Management Plan requires equipment operators to check machines for fauna during pre-start.

Limiting Factor

- Ministerial Statement 1180 and EPBC 2018/8383 requires compliance with all Management Actions stated in the Confirmed Threatened Species Management Plan.

Threatened Species Management Plan

- MANAGEMENT ACTION 14

Amendment Request

- No approval is required from Species and Communities for the deletion of Management Action 14.

Ecological Risk Assessment

- Perdaman engaged GHD Senior Ecologist to review information and assess the risk to threatened species (and conservation significant species and migratory birds) from the removal of 30 minute idling of machinery.

Threatened Species Management Plan

- MANAGEMENT ACTIONS 9 and 14
- GHD provided Technical Memorandum concluding:

  > "assessed a total of 13 threatened and priority fauna species against a proposal to amend the approval conditions for Project Ceres to allow for **night works** to be conducted and the removal of a **machine idling** condition. Of the 13 species assessed, a residual risk rating of low and subsequently negligible (after the adoption of recommended mitigation measures), was allocated to nine species. An initial risk rating of moderate was allocated to four species and after the adoption of mitigation measures this rating was reduced to low.
  >
  > Overall, the proposed amendments present a low risk of potential impacts to the assessed species at a species level. It is GHD's recommendation that the mitigation measures outlined in this document are adopted before the conditions are amended."

- Technical Memorandum included in Threatened Species Management Plan as attachment.

Threatened Species Management Plan

- APPROVAL OF AMENDED MANAGEMENT PLAN – EPBC Act
    - Due to the changes in Management Actions, the revised TSMP becomes a *Revised Management Plan* under the EPBC Act.
    - *Revised Management Plans* require approval in accordance with Condition 23 of EPBC 2018/8383 approval (application under section 143A of the EPBC Act).
    - Reviewed and approved by a delegate of the Federal Minister for Environment.

Consultation with MAC and Submission of Management Plans

- Flora Management Plan
    - any revisions or amendments of the plan must be in consultation with MAC and must be **submitted** to the EPA and DCCEEW as per Conditions 4-6 and 4-7 of MS 1180
- Fauna Management Plan
    - any revisions or amendments of the plan must be in consultation with MAC and must be **submitted** to the EPA and DCCEEW as per Condition 5-8 of MS 1180
- Threatened Species Management Plan
    - Once approved by the Minister's delegate -
    - any revisions or amendments of the plan must be in consultation with MAC and must be **submitted** to the EPA and DCCEEW as per Condition 5-8 of MS 1180
    - the revised plan shall also be provided to DBCA for their records
- Surface Water Management Plan
    - any revisions or amendments of the plan must be in consultation with MAC and must be **submitted** to the EPA as per Condition 8-7 of MS 1180
    - the revised plan shall also be provided to DCCEEW for their records

Consultation with MAC and Submission of Management Plans

- Cultural Heritage Management Plan
    - any revisions or amendments of the plan must be in consultation with MAC and must be **submitted** to the EPA as per Condition 9-8 of MS 1180.
    - provide a complete copy of the plan to DCCEEW within 10 days of submission to the EPA as per Condition 5 of EPBC 2018/8383.
- Greenhouse Gas Emissions Management Plan
    - any revisions or amendments of the plan must be in consultation with MAC and must be **submitted** to the EPA as per Condition 3-4 of MS 1180.
    - the revised plan shall also be provided to DCCEEW for their records
- Light Management Plan
    - any revisions or amendments of the plan must be in consultation with MAC and must be **submitted** to the EPA as per Condition 10-6 of MS 1180.
    - the revised plan shall also be provided to DCCEEW for their records