WRS Bioproducts Pty Ltd

WRS Clearing Permit Application
Clearing Permit Supporting Report

March 2019

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INDEX OF APPLICATION DOCUMENTATION

The clearing permit application was submitted with the following items:

- Form C1 – Application for Area Permit
- ESRI Shapefile of the Clearing Area
- Copy of the Pastoral Lease
- Copy written authority to act on behalf of the owner

1. Introduction

1.1 Background

WRS Bioproducts Pty Ltd (**WRS**) has subleased part of Lot 267 on Plan 93179 and part of Lot 300 on Plan 49873 (together called the **Land**) from Rainstorm Dust Control Pty Ltd (**Rainstorm**). The sublease is conditional on various conditions precedent including a condition requiring WRS to obtain all regulatory approvals to enable it to undertake the Project.

Rainstorm is the occupier of the Land as leasee under Landgate registered Lease N420498 dated the 22 July 2016 on Lot 267 and Landgate N384429 dated the 7th of July 2016 on Lot 300. Both leases are made between the State of Western Australia and Rainstorm and are for a term of 21 years. When the sublease becomes unconditional, Rainstorm intends to assign its rights and interests in the Clearing Permit (when approved) to WRS.

WRS proposes to construct an extensive algae farming operation at Gap Ridge within the City of Karratha, approximately 6 km north west of the Karratha town site, Western Australia (Appendix A – Figure 1).

The proposed development (herein known as the **Project**) is located within the Land.

The Project is proposed to be developed in three Stages. Stages 1 and 2, addressed in this Clearing Permit Application, will require clearing of approximately 151 ha within Lots 267 and 300 only.

1.2 Purpose

GHD was commissioned by WRS to prepare a Clearing Permit Supporting Report for the proposed algae farm operation. A desktop study has been carried out to identify species and areas of ecological and conservation significance within the Project Area at both a site specific and broad scale. The purpose of this report, on the basis of the desktop study, was to undertake an assessment of the proposed Clearing Area against the Ten Clearing Principles under Schedule 5 of the *Environmental Protection Act 1986* (EP Act).

1.3 Scope of works

GHD's scope of works for this Project included desktop searches of publically available, relevant literature and databases and the preparation of this report. GHD has conducted as assessment of the proposed clearing against the Ten Clearing Principles.

1.4 Relevant legislation requirements

In Western Australia some ecological communities, flora and fauna are protected under both Federal and State Government legislation. In addition, regulatory authorities also provide a range of guidance and information on expected standards and protocols for environmental reviews.

An overview of key Commonwealth and Western Australian environmental legislation and guidelines, conservation codes and background information relevant to this project is provided in Table 1-1.

Table 1-1 Key environmental legislation relevant to the Project

Legislation	Responsible agency	Aspect
Commonwealth legislation		
Environment Protection and Biodiversity Conservation Act 1999	Department of the Environment and Energy (DEE)	Matters of National Environmental Significance including threatened flora and fauna
State legislation		
Biodiversity Conservation Act 2016	Department of Biodiversity, Conservation and Attractions (DBCA)	Protection of native flora and fauna
Biosecurity and Agricultural Management Act 2007	Department of Primary Industries and Regional Development (DPIRD)	Weeds and feral animals
Conservation and Land Management Act 1984	DBCA	Use, protection and management of public lands and waters and its flora and fauna
Contaminated Sites Act 2003	Department of Water and Environment Regulation (DWER)	Management of contaminated sites
Environmental Protection Act 1986	Environmental Protection Authority (EPA) (Part IV) DWER (Part V)	Environmental impact assessment and management
Environmental Protection (Noise) Regulations 1997	DWER	Noise standards
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	DWER	Clearing of native vegetation
Land Administration Act 1997	DPIRD	Administration of State Land
Rights in Water and Irrigation Act 1914	DWER	Access to and use of water resources; protection and management of river flows and drainage
Soil and Land Conservation Act 1945	DPIRD	Protection of soil and prevention/management of soil erosion

1.5 Limitations and assumptions

This report has been prepared by GHD for WRS Bioproducts and may only be used and relied on by WRS Bioproducts for the purpose agreed between GHD and the WRS Bioproducts as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than WRS Bioproducts arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by WRS Bioproducts and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Project Description

2.1 Project description

WRS proposes to develop a commercial-scale algae farm, and associated processing facilities, north-west of Karratha City in the Pilbara region of Western Australia. The proposed algae project involves the cultivation and harvesting of algae *Dunaliella salina*, a genus of one-celled green microalgae.

The overall Project consists of four main parts – cultivation, harvesting, separation and processing of algae. The algae are cultivated in shallow open ponds filled with high saline water in the presence of sunlight, seawater, CO2, nutrients and trace elements to promote algae growth. After cultivation, water-containing algae will be pumped from the ponds to a harvesting plant housed in a shed adjacent to the ponds. The algae are harvested from the ponds and dried before being sent to an offsite processing facilities.

The end products from processing will be:

- Food colourant;
- Protein rich biomass suitable for farmed fish and animal feed; and
- Omega 3 oils suitable for human consumption.

The Project incorporates the following elements:

- Algae ponds for the cultivation of algae
- Settling pond
- Sea-water pond and associated pipeline / pump station.
- Algae harvesting and dewatering, including harvesting channel
- Processing plant
- Product storage area
- Ancillary facilities (e.g. offices, storage, workshops etc.)

The proposed Project layout is provided in Appendix A – Figure 2.

2.1.1 Construction methodology

The Algae Ponds will be constructed as compacted impervious clay material and will be armoured on the exterior faces. The Algae Pond wall height will be approximately 2 m, in accordance with predicted flood modelling data to enable management of 1:100 yr predicted flood events.

Water in the ponds will be maintained at high salinity levels by utilising waste bitterns that are flowing from Dampier Salt Operations into Nickol Bay. An above ground pipeline will transfer the waste bittern from Nickol Bay to the algae ponds.

2.2 Project and Clearing Area

The Project comprises three lots (Table 2-1) and the proposed lease area usage covers a portion of each lot (Appendix A – Figure 1 and Figure 2). The Clearing Area addressed within this document comprises Stage 1 and Stage 2 only and is approximately 151 ha. Stages 1 and 2 are located within Lot 267 and Lot 300 only. A separate clearing permit application will be submitted prior to the development of Stage 3 (Lot 4229).

Table 2-1 Site details

Stages	Lot	Address	Lot Area (ha)	Proposed Lease Area Usage (ha)	Clearing Area under this Application (ha)
1 & 2	Part Lot 267 on Plan 93179	-	245.7287	Approx. 30	Approx. 30
	Lot 300 on Plan 49873	-	138.3207	Approx. 125	Approx. 121
3	Lot 4229 on Plan 188048	Lot 4229 Bayly Ave, Gap Ridge	68.5702	Approx. 45	0
		Total	452.6196	Approx. 195	151

3. Methodology

A desktop assessment of the Project and the potential constraints of the proposed works was undertaken by viewing GIS spatial files and reviewing relevant reports and publically available, government managed databases. The information sources utilised in this assessment are presented in Table 3-1.

Table 3-1 Information sources

Aspect	Information Source
Climate	Bureau of Meteorology Climate Data Online (BoM 2018)
Geology, landform and soils	An Interim Biogeographic Regionalisation (IBRA) for Australia (Thackway and Cresswell 1995) An inventory and condition survey of the Pilbara region, Western Australia (Van Vreeswyk *et. al*. 2004) Soil landscapes (Tille 2006) EPBC Act Protected Matters Search (DEE 2018b) Biodiversity Audit of Western Australia's (Kendrick and Stanley 2001) Report for Karratha Potential Groundwater Supply (GHD 2010)
Acid Sulphate Soils	DWER Acid Sulfate Soil Risk Map – Pilbara Coastline (Government of Western Australia (GoWA) 2018b)
Contaminated sites	DWER Contaminated Sites Database (GoWA 2018b) DWER Basic Summary of Records (Appendix B)
Land use and reserves	DBCA Legislated Lands and Waters (GoWA 2018b) City of Karratha Local Planning Scheme No. 8 (DPLH 2018)
Environmentally Sensitive Areas	DWER Clearing Permit System Map Viewer (DWER 2018a)
Hydrology and hydrogeology	Water information Reporting (DWER 2018b) The Pilbara Coast Water Study (Haig 2007) Groundwater Resources of Major Catchments in the Pilbara Region (Skidmore 1996) Report for Karratha Potential Groundwater Supply (GHD 2010)
Surface water and groundwater	DWER data layers (GoWA 2018b): Hydrographic Catchments – Catchments Hydrographic Catchments – Sub-catchments Public Drinking Water Source Areas RIWI Act, Groundwater Areas RIWI Act, Rivers RIWI Act, Surface Water Areas and Irrigation Districts Surface Water Allocation Areas DBCA data layers (GoWA, 2018): Ramsar Sites
Matters of National Environmental Significance (MNES)	EPBC Act Protected Matters Search Tool (DEE 2018b)
Vegetation	Beard vegetation mapping (1975) State wide Vegetation Statistics (GoWA 2018a) Soil Landscapes (Tille 2006)
Threatened and Priority Ecological Communities	DBCA Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) spatial dataset DPaW Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) spatial datasets EPBC Act 1999 Protect matters search tool (PMST) (DotE 2016a)
Conservation Significant Flora and Fauna	DBCA *NatureMap* database (DBCA 2007–) DBCA Threatened and Priority Fauna database (TPFL) Western Australian Herbarium database (WAHERB)

4. Assessment of desktop environmental aspects and impacts

4.1 Physical environment

4.1.1 Climate

The Project is located within the Pilbara region of Western Australia. The Pilbara region experiences two distinct seasons consisting of hot summers from October to April and mild winters from May to September. The area lies in a semi desert climate characterised by hot, dry weather, low average rainfall and desert vegetation types.

The majority of the Pilbara has a bimodal rainfall distribution, resulting in two rainfall maxima per year. From January to March, rain results from storms penetrating from the north, producing sporadic and intense thunderstorms. Tropical cyclones and depressions moving southwards from northern Australian waters also cause heavy rainfall events. From May to June cold front move easterly across Western Australia and may occasionally reach the Pilbara region. These fronts produce light winter rains that are generally ineffective for extensive plant growth. Surface water can be found in some pools and springs in the Pilbara region all year round, although watercourses only flow briefly due to the short wet season.

Cyclone season extends from 1st November to 30th April, although very few tropical cyclones have occurred in November. Tropical cyclones can produce very destructive winds, heavy rainfall causing flooding, and damaging storm surges. Destructive winds can cause extensive damage to infrastructure and if storm surge occurs at the same time as high tide then the area inundated can be quite extensive, particularly along coastal low-lying areas.

The closest meteorological recording station (Karratha aero 004083) is located at Karratha Airport, approximately 2 km west of the Project. Climatic data from this station is presented in Table 4-1.

Table 4-1 Climate Data

Weather Aspect	Value
Mean daily maximum temperature	36.2°C (March) to 26.3°C (July)
Mean daily minimum temperature	26.8°C (January) to 13.8°C (July)
Annual rainfall	300.4mm
Mean annual rain days	27 days

Source: Bureau of Meteorology (BoM), September 2018

4.1.2 Bioregion and Land System

The Interim Biogeographic Regionalisation of Australia (IBRA) divides Australia's landscapes into 89 large geographically distinct bioregions based on major biological and geographical / geological attributes (Thackway and Cresswell 1995). These bioregions are further subdivided into 419 subregions, which are more localised and homogenous geomorphological units in each bioregion (DEE 2018a).

The Clearing Area lies within the Roebourne subregion (PIL4) of the Pilbara bioregion. The Pilbara IBRA region corresponds broadly with the Pilbara Craton, a major geological block of Archaean origin.

The landscape of the subregion tends to be dominated by rugged hills and ranges with stony plains and some alluvial plains and sandplains on the volcanic, granitic and sedimentary rocks of the Pilbara Craton. These are typically overlain by a relatively thin veneer of Cainozoic (Quaternary) sediments. The Roebourne subregion is described by Kendrick and Stanley (2001) as quaternary alluvial and older colluvial coastal and subcoastal plains with alluvial flats and deltas. Red deep sands and red sandy earths are found in the Pilbara sandplains. Stony soils, red shallow loams and red shallow sands are common on hills and ranges throughout the Pilbara. Red/brown non-cracking clays, red shallow sandy duplexes and red shallow loamy duplexes are also present on plains, alluvial plains, stony plains and low hills across the Pilbara region (Tille 2006).

The Pilbara coastal strip includes bare mudflats, coastal dunes, sandy plains and broad deltaic deposits associated with the mouths of major rivers. The coastal area is situated on marine deposits and some sedimentary and volcanic rocks of the Pilbara Craton. The coastal fringe of the area has tidal soils with beach zones of calcareous deep sands (Van Vreeswyk et. al. 2004).

Land Systems

The Clearing Area is located within the Littoral Land System as mapped in the DPIRD Soil Landscape Mapping – Rangelands. This map unit is described as: "*Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests"* (GoWA 2018b).

4.1.3 Topography, geology and soils

The Karratha Coastal Vulnerability Study (JDA Consultant Hydrologists et al. 2012) includes topography mapping for the Project. This indicates that there would be a low elevation at approximately 2.2 m AHD.

According to the Dampier (1:100,000) Geological Series map (2256) (Hickman 1997) there are three surface soils within the Clearing Area:

- Qhmu – Silt and mud in supratidal to intertidal flats and lagoons. Occurs over most of the Clearing Area,
- Qhms – Shelly sand in coastal dues and old beach deposits; contains *Anadara granosa*. Occurs in a small sections along the north west and southern boundaries of the Project,
- Qs – Eolian sand – red-yellow wind blown sand local sand ridges. Occurs in a small section on the south west corner of the Project.

GHD (2010) completed a desktop hydrogeological assessment of the *Karratha Potential Groundwater Supply*, which included the entirety of the Clearing Area. This assessment identified that the geology of the Clearing Area is dominated by recent sedimentary units associated with local river systems and the Projects' proximity to Nickol Bay, which lies to the east.

The eastern and southern sections of the Project consist of silt and mud in supratidal to intertidal flats and lagoons. The western quarter of the Project contains two intrusions, one of shelly sand in coastal dunes and old beach deposits and the other re-yellow, windblown eolian sand from the Great Sandy Desert. The northern section of the Project contains both the silt and mud in supratidal to intertidal flats and lagoons, as well as marine mud and silt, intertidal with mangroves (GHD 2010).

4.1.4 Contaminated sites

The DWER Contaminated Sites Database presents information on known or suspected contaminated sites that have been classified by the DWER within the following categories:

- Contaminated – remediation required
- Contaminated – restricted use
- Remediated for restricted use

The DWER Contaminated Sites Database does not provide details of the sites that are listed as 'Possibly contaminated – investigation required' (PC-IR). A search of the database identified no known contaminated sites within the Project area. The closest contaminated site is approximately 4 km west of the Project and is classified as "Contaminated – remediation required".

Although a search of the database indicated that the Project and immediate surrounds have not been reported as known contaminated sites at the time of reporting (DWER September 2018), a request for a Basic Summary of Records (BSR) was submitted to the DWER for Lot 267 and Lot 300. The BSR (provided by WRS, dated July 2016), Appendix B, indicates that Lot 267 is classified as "*Possibly contaminated – investigation required*" (PC-IR) under the *Contaminated Sites Act 2003*.

The BSR indicates that Lot 267 was first reported in 2006 based on historical use "*as a purpose built evaporation facility for solar salt manufacturing, which contains areas such as former landfills, workshops, fuel farms, plant and support facilities and effluent disposal areas, for approximately 47 years since 1968".* Lot 267 was first classified under section 13 of the *Contaminated Sites Act 2003* in 2009 based on information submitted to the, then, Department of Environment Regulation (now DWER).

Several investigations have been completed within Lot 267 from April 2009 to February 2015. The assessments described several potential areas of concern, described as Area 1 to Area 30. A Site Management Plan (dated February 2015) has also been prepared however it is unknown how this pertains to different activities within various areas of Lot 267.

The Site Classification within the BSR indicates that:

- *Concentrations of contaminants have been found to exceed adopted assessment levels. A tier 1 screening risk assessment has therefore indicated that further investigation is required to determine the risk to the environment and environmental values.*
- *The majority of the site comprises ponds and channels used for solar salt manufacture. In several areas of the site, groundwater was found to contain elevated concentrations of salts or metals. Future investigations should consider the potential for point sources of dissolved salts to have caused soil, groundwater, surface water or sediment contamination.*
- *Based on the information provided, the site appears suitable for continue commercial/industrial use, but may not be suitable for more sensitive land uses (such as residential housing, or child care centres).*
- *As there are grounds to indicate possible contamination of the site and surface water, sediment and groundwater has not been fully investigated, the site classified as 'possibly contaminated investigation required'.*

Consultation with DWER by WRS indicates that Area 18 (only) is located in the north western corner of Lot 267 associated with bitterns ponds and is some distance from development proposed by WRS (pers comms Harry Rosen, Director – WRS, 5/11/2018).

4.1.5 Acid sulfate soils

A review of the DWER ASS risk mapping for Pilbara Coastline (GoWA 2018b) indicates the Clearing Area is located within "*High to moderate risk of ASS occurring within 3 m of natural soil surface that could be disturbed by most land development activities*" (Appendix A – Figure 3).

The ASS risk mapping data has been determined from topographical maps, survey and GPS. For mapped ASS disturbance risk, accuracy has been largely determined by geology unit mapping and Department of Primary Industry and Regional Development (DPIRD) 1:50,000 soil-landscape mapping, supported by field soil survey and interpretation of high resolution aerial photography. Boundaries of high risk areas with any other risk categories identified by on-ground mapping are known to be accurate to +/- 50 m, whereas accuracy of boundaries between moderate to low and low to nil map units are estimated to be at least +/- 100 m. On this basis, care should be taken when interpreting data solely from this data source.

4.1.6 Potential impacts

The Project will potentially result in impacts to the physical environment, including:

- Risk of water (including tidal events) and wind erosion as a consequence of vegetation clearing exposing soils. The risk of erosion will be managed through the EMP that will include:
  - Only clearing the minimum amount necessary to construct and stabilising / rehabilitating areas immediately.
  - Design and construction techniques will include water (tidal/surge/flooding) management to prevent the erosion of sediments and soils (see Section 4.3 for further information).
- Undisturbed ASS do not pose a risk, and only become an issue where excavation occurs to certain depths. Consideration as to the requirement for ASS investigation and management should be based on the ongoing construction requirements for the Project.
- The BSR (Appendix B) indicated that several studies have been undertaken across the Lot and that further investigations are required in certain areas of Lot 267. A Site Management Plan (February 2015) has also been prepared. As the Project only occurs over part of the Lot, it is recommended that further investigation and review of the existing contamination reports be undertaken to determine the potential for contamination and exposure from the Project. The Site Management Plan should be implemented (if applicable).

4.2 Land use

4.2.1 Land vesting

The Project occurs on land that is zoned 'Rural' under the City of Karratha's Local Planning Scheme No.8 and falls within the use class 'Intensive Agriculture' which is a permitted use within the 'Rural' zone (DPLH 2018). It is noted however, that the adjoining land south of the Project is zoned for 'Conservation Recreation and Natural Landscapes'.

4.2.2 DBCA legislated lands and waters

The Project is not located within any DBCA legislated lands and waters (GoWA 2018b). The closest DBCA lands are:

- Murujuga National Park – located approximately 5 km north-west of the Project,
- Un-named Crown Land (R 38287) for the purpose of an Arboretum. Located approximately 9 km south-east of the Project.

4.2.3 Environmentally Sensitive Areas

There are no Environmentally Sensitive Areas (ESAs) that intersects with the Project or within 5 km of the Clearing Area. The closest ESA is an island located approximately 17 km northwest of the Project (DWER 2018a).

4.2.4 Potential impacts

The Project is unlikely to result in impacts to the surrounding land use. The proposed Project involves 'Intensive Agriculture' which is a land use permitted within the Rural zone. The Project will be designed, constructed and managed to prevent any off-site impacts including those to the adjacent land that is zoned as Conservation Recreation and Natural Landscape.

The Project will not directly impact on any DBCA lands given they are located over 5 km from the Project.

There will be no impact to ESAs given that there is no occurrence of these areas within the vicinity of the Project.

4.3 Hydrology

Desktop searches of the DWER hydrology layers (GoWA 2018b) were undertaken and are summarised in Table 4-2.

Table 4-2 DWER data queries for the Project (GoWA 2018b)

Aspect	Details	Result
Groundwater Areas	Groundwater areas proclaimed under the *Rights in Water Irrigation Act 1914* (RIWI Act)	The Project lies within the Pilbara Groundwater Area
Surface Water Areas and Irrigation Districts	Surface water areas Irrigation Districts proclaimed under the RIWI Act	The Project lies within the Pilbara Surface Water Area
Rivers	Rivers proclaimed under the RIWI Act	None present
Public Drinking Water Source Areas (PDWSA)	PDWSA is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas declared (gazetted) under the provisions of the *Metropolitan Water Supply, Sewage and Drainage Act 1909* or the *Country Area Water Supply Act 1947* (CAWS Act).	None present
Waterways Management Areas	Areas proclaimed under the *Waterway Conservation Act 1976*	None present
Clearing Control Catchments	*Country Area Water Supply Act 1947* Part 2A.	None present

4.3.1 Hydrogeology and hydrology

Based on the geology of the site and the surrounding area, two types of prospective aquifers are present (GHD 2010). These are shallow alluvial aquifer and fractured and weathered bedrock.

Shallow alluvial aquifer

Typically, these comprise of quaternary alluvial aquifers where there is sufficient sedimentary cover over basement bedrock. These are deepest and most productive in active river channels and palaeochannels where alluvial deposits of sands and gravels tend to be thickest. The alluvial aquifers are recharged by rainfall events within the catchments, typically flood events associated with the cyclone season. As a result, water quality ends to be relatively fresh (i.e. low salinity values). In coastal areas, the water quality can be impacted by salinity from coastal saline wedges (Haig 2007, Skidmore 1996).

Fractured and weathered bedrock

Weathered profiles of the granitic bedrock can produce aquifers of local significance. These tend to be varied in terms of potential storage and permeability. This can be significantly influenced by the presence of structural features such as faults and fractures that have the potential to greatly increase the aquifer's viability for potential use.

The aquifers are recharged through rainfall and leakage from the overlying alluvial sequence. Water quality can be expected to be relatively fresh, with some potential impact of salinity in coastal areas (GHD 2010).

Bore search

A DWER Water Information Reporting (WIR) bore search was undertaken to assess registered bores within the vicinity of the Project. The DWER WIR bore search reported no registered bores within 1 km radius and the closest bore is located 3 km from the Project (DWER 2018b).

It is possible that unregistered bores may exist in the area.

4.3.2 Surface water and drainage

The Project is located within Karratha Coast sub-catchment as part of the Port Hedland Basin within the Indian Ocean Division (GoWA 2018b). It is located within the projected limit of the shoreline and limit of marine influence (as shown in Figure 10, JDA Consultanting Hydrologists et al. 2012). The Indian Ocean is located approximately 2 km to the east of the Project.

Yandicoogina Creek occurs along the northern boundary of the Clearing Area, with aerial photography showing that there are drainage lines through the Clearing Area that drain into this creek and then to the Indian Ocean.

Nickol Creek lies directly to the north of the Clearing Area and discharges to Nickol Bay to the east (Appendix A – Figure 4).

Storm Surge / Flooding

The JDA Consulting Hydrologists et al. (2012) study was used to inform the City of Karratha Storm Surge Risk Policy (Local Planning Policy DP 19). This mapping indicated that the 100 yr ARI flood depth (based on the 2010 climate scenario) for the Clearing Area would be greater than 2 m. The Storm Surge Vulnerability Maps (provided in City of Karratha, DP 19) show that the Clearing Area would likely be in an area of greater than 3.5 m (500 Yr ARI Surge Inundation Depth).

WRS have indicated that the Clearing Area ground levels are between 2.08 and 2.48 mAHD, and the perimeter walls and process areas will be designed at approximately 4.50 mAHD to the top of road level.

4.3.3 Wetlands

A search of the EPBC Act Protected Matters Search Tool (Department of the Environment and Energy 2018) identified no internationally important (Ramsar) or Nationally Important Wetlands located within 10 km of the Project. The closest Ramsar wetland is located approximately 320 km east northeast of the Clearing Area. The closest nationally important wetland is located approximately 92 km south of the Clearing Area.

4.3.4 Potential impacts

The Project will involve construction of a sea wall and filling of the site to construct the algae ponds and associated infrastructure. Potential impacts to hydrology include:

- Groundwater – the Project is located within the proclaimed Pilbara Groundwater Area. Should groundwater be needed (taken) or a well/bore constructed/altered, a licence from DWER may be required.
- Surface water – the Project is located within the proclaimed Pilbara Surface Water Area. Water required (taken) or diverted from a drainage line or creek, a permit from DWER will be required.
- Contamination from ponds – the Algae Ponds will be constructed as compacted impervious clay material and will be armoured on the exterior faces. WRD have indicated that there is a solid clay base under the sand surface in the Project location.
- Erosion/sedimentation – during the construction phase and for any permanently cleared areas there is the potential for erosion and sedimentation and export of sediments during peak tides and cyclonic events into Nickol Bay.
- Pollution impacts – the storage and handling of chemicals and hydrocarbons (during the construction phase) will require management to prevent pollution of soil and drainage lines.
- There is also the potential for the mud flat to be subject to wind erosion if the vegetative cover is removed, and prone to water-logging during periods of peak tides or overland flows.
- Flooding impacts – these will be managed through the design of the Project. The design and layout of the ponds and bunding walls have been informed from the 1 in 100 year floodplain modelling.

The proposed works are not expected to significantly alter the hydrological regime, given appropriate design and management, which will maintain the existing drainage patterns and prevent erosion / sedimentation and / or the transportation of sediments off site. It is anticipated that standard management practices will be implemented during the construction through a project-specific EMP to mitigate aspects that have the potential to cause direct and indirect impacts on hydrology.

WRS's design engineers have indicated they would not predict any erosion or sediment transfer under peak tides or surge event. The perimeter walls will be constructed of an impervious compacted clay material and will be rock armoured on the exterior faces.

4.4 Vegetation and flora

4.4.1 Regional biogeography

The Project is located within the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) region (Thackway and Cresswell 1995). The Roebourne subregion is characterised by grassland of mixed bunch grass (*Aristida* spp., *Enneapogon* spp.), tussock grass (*Cenchrus* spp., *Eriachne* spp., *Eragrostis* spp., Sorghum spp.) and hummock grass Triodia spp. and dwarf

to open shrubland of snakewood (*Acacia xiphophylla*) and A. *stellaticeps* over soft spinifex, mostly *Triodia pungens* and *T. epactia* (Kendrick and Stanley 2001).

4.4.2 Broad vegetation mapping and extent

Broad scale pre-European vegetation mapping, scale of 1:1,000,000, of the Pilbara region was completed by Beard (1975) at an association level. This mapping indicates that the Clearing Area occurs within one vegetation association within the Abydos Plain – Roebourne system association:

- Vegetation association 127 – *Tidal mud flat*.

The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the DBCA – latest update December 2017 (GoWA 2018a).

As shown in Table 4-3, the current extent of vegetation association 127 is more than 87% of its pre-European extent at the IBRA bioregion, IBRA subregion the Local Government Authority (LGA) levels; this puts it above the 30%. Threshold level1.

Table 4-3 Extents of vegetation associations mapped within the Clearing Area (GoWA 2018a)

Veg. Assoc.	Scale	Pre-European Extent (Ha)	Current extent (Ha)	Remaining (%)	Remaining within DBCA managed land (%)
IBRA Bioregion - Pilbara		17,808,657.05	17,733,583.88	99.58	10.16
127	State: WA	737,724.05	697,871.38	94.60	10.03
	IBRA Bioregion:	177,749.75	159,595.04	89.79	2.32
	Sub-region: Roebourne	177,749.75	159,595.04	89.79	2.32
	LGA: City of Karratha	96,204.40	83,703.40	87.01	4.37

4.4.3 Vegetation types

A review of aerial photography and other flora studies in the vicinity of the Project indicates that the dominant vegetation type is likely to be mud flats with Chenopod shrublands.

Mud flats: the mudflats appear to be the dominant landform throughout the Clearing Area. These are likely to contain bare areas as well as Chenopod shrublands. The tidal mud-flats are known to support blue-green algae mats and tidal samphire communities, which may harbour undescribed and possibly Pilbara endemic samphire's (Pilbara Corridors, 2016).

Mangroves - Along the northern and western border of the Clearing Area are scattered mangroves, which form stands along the creek-lines towards Nickol Bay (immediately outside of the Clearing Area). The mangrove habitats from a highly productive part of the coastal foreshore system. The mangroves along the Karratha coastline are considered to be sub-regionally and regionally significant arid zone mangroves (Essential Environmental 2014 and Pilbara Corridors 2016). The importance of the Pilbara mangrove communities is also recognised by the EPA in their Guidance Statement for the protection of tropical and arid zone mangroves along the Pilbara coastline (EPA 2001). Under this guideline that Project falls within a Guideline 4 area, the objective of which is to: *'The EPA's operational objective for Guideline 4 areas is that the*

[1] The 30 % threshold level is the level below which species loss appears to accelerate exponentially at an ecosystem level (ANZECC 2000).

impacts of development on mangrove habitat and ecological function of the mangroves in these areas should be reduced to the minimum practicable level'.

WRS has provided photographs of the Clearing Area (Plate 1), which show the large areas of bare mud flats with scattered chenopods.

Plate 1 Photographs of the Project area (provided by WRS)

4.4.4 Conservation significant ecological communities

A search of the DPaW Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC) databases identified that there are no TEC and 5 PEC within 20 km radius of the Clearing Area (Appendix A– Figure 5).

Based on a review of the aerial photography, soil / geology mapping and the broad Beard (1975) vegetation associations it is considered unlikely that any of these PECs are present within the Clearing Area (Table 4-4).

Table 4-4 Priority Ecological Communities within 20 km of the Project

Description - Status	Location	Likelihood of occurrence
Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays - Priority 1	18 occurrences within the 20 km search area. One PEC / buffer area (2000 m) mapped within the Clearing Area	Unlikely – based on aerial photography and Beard 1975 mapping.
Burrup Peninsula rock pool communities - Priority 1	Three occurrences within the 20 km search area. The nearest PEC located 7 km north west of the Clearing Area on the Burrup Peninsula	Unlikely – based on aerial photography, Beard 1975 mapping and geology information.

Burrup Peninsula rock pile communities - Priority 1	62 occurrences within the 20 km search area. The nearest PEC located 8.8 km north west of the Clearing Area on the Burrup Peninsula	Unlikely – based on aerial photography, Beard 1975 mapping and geology information.
Coastal dune native tussock grassland dominated by *Whiteochloa airoides* – Priority 3	One occurrence of the PEC located 6.6 km east of the Clearing Area	Unlikely – based on aerial photography, Beard 1975 mapping and geology information.
Horseflat land system of the Roebourne Plains – Priority 3	16 occurrences within the 20 km search areas. Two Pec / buffer area (2000 m) mapped within the Clearing Area	Unlikely – based on aerial photography, Beard 1975 mapping and geology information.

It should be noted DPaW provides locations for TECs and PECs that have a buffer placed typically between 500 m and 5,000 m radius around the community. As such, the TEC/PEC may not be present within the entire extent of the buffer area.

4.4.5 Flora diversity

A search of the NatureMap database identified 583 flora taxa, representing 86 families and 241 genera previously recorded within 20 km radius of the Project (Appendix C). This total comprised 547 native flora taxa and 36 naturalised (introduced) flora taxa. Dominant families recorded included Fabaceae (105 taxa), Poaceae (67 taxa) and Chenopodiaceae (38 taxa).

4.4.6 Conservation significant flora

Desktop searches of the EPBC Act PMST database, *NatureMap* database and the DPaW TPFL and the WAHERB databases identified the presence/potential presence of nine (9) conservation significant flora taxa within 20 km of the Project area (Appendix C). The desktop searches identified:

- Eight (8) Priority 3 taxa
- One (1) Priority 4 taxa

As shown in Appendix A - Figure 5, there are no known records of conservation significant flora within the Project or Clearing, with many of the records occur on the Burrup Peninsula.

A likelihood of occurrence assessment was conducted for all conservation significant flora taxa identified in the desktop assessment (Table 4-5). This assessment took into account previous records and habitat requirements and likely habitat present (desktop assessment only). The likelihood of occurrence assessment concluded that the nine conservation significant species identified in the desktop searches are unlikely to occur. None of these species are known to occur in tidal mud flats / chenopod shrublands or mangroves (the vegetation types likely within the Clearing Area).

Table 4-5 Likelihood of occurrence conservation significant flora

Species - status	Description (WA Herbarium 1998-)	Likelihood of occurrence
Eragrostis surreyana – Priority 3	Records from soaks with Eucalyptus / Melaleuca / Acacia woodlands and scrub.	Unlikely – habitat not present within the Clearing Area.

Gymnanthera cunninghamii – Priority 3	Erect shrub, 1-2 m high. Fl. cream-yellow-green, Jan to Dec. Sandy soils.	Unlikely – habitat not present within the Clearing Area.
Rhynchosia bungarensis – Priority 4	Compact, prostrate shrub, to 0.5 m high. Fl. yellow. Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	Unlikely – habitat not present within the Clearing Area.
Schoenus punctatus – Priority 3	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), ca 0.6 m high. Fl. brown, Aug. Watercourses.	Unlikely – known from creek lines in the Burrup peninsula, does not appear to occur in tidal areas.
Stackhousia clementii – Priority 3	Dense broom-like perennial, herb, to 0.45 m high. Fl. green/yellow/brown. Skeletal soils. Sandstone hills.	Unlikely – habitat not present within the Clearing Area. Closest known record 3.5 km west.
Terminalia supranitifolia – Priority 3	Spreading, tangled shrub or tree, 1.5-3 m high. Fl. green-yellow, May or Jul or Dec. Sand. Among basalt rocks.	Unlikely – habitat not present within the Clearing Area.
Themeda sp. Hamersley Station (M.E. Trudgen 11431) – Priority 3	Records show known occurrences on plains with orange sandy clay, creeklines, floodplains with red-brown cracking clays.	Unlikely – not known from tidal area, Habitat nor present within the Clearing Area. Closest known record 3 km west.
Oldenlandia sp. Hamersley Station (A.A Mitchell PRP 1479) – Priority 3	Spreading annual, herb, 0.05-0.1 m high. Fl. blue, Mar. Cracking clay, basalt. Gently undulating plain with large surface rocks, flat crabholed plain.	Unlikely – habitat not present within the Clearing Area. Other records show the typical surrounding vegetation to be tussock grasslands. Closest known record 5 km south west.
Vigna triodiophila – Priority 3	Records from the Karratha area in Burrup on skeletal soil, at the base of high rockpile ridges, outcrops, hillside.	Unlikely – habitat not present within the Clearing Area.

4.4.7 Potential impacts

The Project will result in the direct loss of native vegetation as a result of constructing the proposed algae farm. The Project may result in the following impacts on vegetation and flora:

- Vegetation – the Project will require clearing of up to 151 ha of tidal mud flats and associated vegetation. This will result in a reduction in the extent of native vegetation from the local and regional areas. However, clearing of vegetation for the Project is unlikely to result in significant local or regional impacts to the extent or type in the area. At both regional and local scales over 87 % of this broad vegetation association remains (Table 4-3), and the proposed clearing of 151 ha would not reduce the extent remaining to less than 86 % at the local (City of Karratha) or regional scales.
- Flora – the Project will require clearing of native vegetation. There are no known conservation significant species within the Clearing Area. Those species known from the surrounding 20 km buffer are considered unlikely to inhabit the mudflat present within the Clearing Area.
- Introduction and/or spread of weeds – the Project has the potential to contribute to weed introduction and spread into adjacent vegetation. This is not likely to be a significant issues, however, hygiene management will be required to prevent impacts to adjacent vegetation and nearby conservation area.

- Mangroves occur along the northern and western boundary of the Clearing Area. WRS have committed to avoiding the clearing of any mangroves. The EMP will include measures to prevent the inadvertent damage to mangroves this will include erosion and sedimentation management to prevent sedimentation in the mangrove system.
- The Project will be designed to prevent the off-site transport of sediment / materials and groundwater contamination through the use of engineering designs such as bunds around the ponds / Project to minimise the risk of flooding / tidal and storm surges exposing and transporting material. Furthermore, the ponds to be designed and monitored to minimise the risk of leakage. This will reduce the likelihood and severity of off-site impacts to adjacent vegetation.
- Any areas not required for on-going operations will be rehabilitated. At Project completion the area will undergo decommissioning and rehabilitation.

4.5 Fauna

4.5.1 Fauna habitat

The Project contains native vegetation which provides fauna habitat. The fauna habitat likely to be present is mangroves / intertidal areas and mud flats. Generally, mangrove habitats form a highly productive part of the coastal foreshore ecosystem. Mangrove habitats and intertidal areas are rare in arid conditions, those of the Pilbara are of scientific importance. The inter-tidal flats are typically characterised by rich and diverse fauna of burrowing invertebrates, and are a habitat for migratory birds that use the mud flats as feeding grounds (Pilbara Corridors, 2016). CALM (2002) have identified mangroves in the Nickol Bay area as having sub-regional significance as they provide habitat for conservation significant birds.

4.5.2 Fauna diversity

A search of the *NatureMap* databases identified 651 fauna species previously recorded within 20 km of the Project (Appendix C). The *NatureMaps* search identified a large number of marine species due to the search (20 km buffer) incorporating marine environments. The 651 fauna species identified comprised 206 birds, 102 retiles, 44 mammals, 4 amphibians, 88 fish, and 207 invertebrates. Of the 651 fauna species previously recorded, 639 were native species and twelve (12) were naturalised (introduced) species.

4.5.3 Conservation significant fauna

Desktop searches of the EPBC Act PMST and NatureMap databases identified the presence/potential presence of 57 conservation significant fauna species within 20 km of the Project (Appendix C). The desktop searches recorded:

- Five (5) species listed as Priority by DBCA (3 mammals and 2 reptiles);
- Eighteen (18) species listed as Vulnerable, Endangered or Critically Endangered under the EPBC Act and/or as Schedule 1-4 (Threatened) under the *Biodiversity Conservation Act 2016* (BC Act) (11 Birds, 4 mammals, and 3 reptiles);
- Forty-one (41) species listed as migratory / marine under the EPBC Act and/or as Schedule 5 (Migratory birds protected under an international agreement) under the BC Act.

(Note those species that are exclusively marine have been excluded from this assessment).

A likelihood of occurrence assessment was conducted for all conservation significant faun species identified in the desktop assessment (Appendix D). This assessment took into account previous records, species biology and habitat requirements through desktop assessment only.

The likelihood of occurrence assessment concluded that the following bird species are likely to utilise the Clearing Area as opportunistic visitors:

- 34 migratory / marine birds
- Nine (9) BC Act and EPBC Act listed birds (many of which are also listed as marine / migratory and included in the 34 species above).

One reptile, *Ctenotus angusticeps* (Airlie Island Skink) (Priority 3, Vulnerable – EPBC Act) is also considered likely to occur with the Clearing Area providing habitat for the species as it is associated with samphire and mudflats typically fringing mangroves and where crab holes are present. This is known to occur west of the Karratha airport and is likely to be present in the Clearing Area.

4.5.4 Potential impacts

The Project will result in the direct loss of native vegetation and associated fauna habitat. The project may result in the following impacts on fauna:

- Habitat loss and fragmentation - the Project will result in habitat loss through clearing of 151 ha of native vegetation. Whilst the Project will further fragment fauna habitat, it is unlikely to have a significant impact on local and regional linkages given its location to existing infrastructure and the extent of native vegetation in local and regional areas.
- Habitat loss for migratory and marine waterbirds and *Ctenotus angusticeps* (Airlie Island Skink) – the habitats present are known to support waterbirds in the Karratha area. The Project will result in the loss of this habitat (feeding) for these species. The Airlie Island Skink is also known from the area west of Karratha airport and likely to occur within the Clearing Area.
- Death or injury of fauna during clearing, construction and operation (including road kills): it is not expected that the widening of the existing highway will increase/alter the number of fauna vehicle strikes from existing conditions.
- Secondary impacts from noise, dust and vibration during clearing and construction activities: this may temporarily scare fauna away from the Project but is unlikely to have any permanent impact on local fauna populations.
- Spread of weeds which may change fauna habitat conditions: this will be managed during construction under an EMP, therefore it is not expected that fauna habitat will be impacted.
- Pollution (e.g. oil spills): this may negatively impact on the health of fauna and/or fauna habitat in the immediate vicinity. The EMP will include hydrocarbon and waste management to mitigate this potential impact.

5. Assessment of vegetation clearing

The clearing of vegetation in Western Australia is regulated by DWER and requires a permit under Part V of the *Environmental Protection Act 1986* (EP Act), except when a project is assessed under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing Native Vegetation) Regulations 2004* and not in an ESA.

When preparing a native vegetation clearing application, an assessment of the Clearing Area against the Ten Clearing Principles should be undertaken to inform this process. The Ten Clearing Principles aim to ensure potential impacts resulting from removal of native vegetation can be assessed in an integrated way.

An assessment of the proposed native vegetation clearing within the Clearing Area against the Ten Clearing Principles was undertaken. Refer to Table 5-1. This assessment concluded the proposed clearing associated with Stages 1 and 2 of the Project may be at variance to the following Principle's:

- (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.
- (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
- (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
- (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
- (j) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Table 5-1 Assessment of the proposed Clearing Area against the ten clearing principles

Principle	Assessment	Outcome	References
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	A search of the NatureMap database identified 583 flora taxa, representing 86 families and 241 genera previously recorded within 20 km radius of the Clearing Area. This total comprised 547 native flora taxa and 36 naturalised (introduced) flora taxa. Searches of the EPBC Act PMST database, *NatureMap* database and DBCA TPFL and WAHERB databases identified the presence/potential presence of 9 conservation significant flora taxa within 20 km of the Clearing area. A likelihood of occurrence assessment concluded that these nine (9) species are unlikely to occur within the Clearing Area. A search of the *NatureMap* databases identified 651 fauna species (including 12 naturalised/introduced species) previously recorded within 20 km of the Clearing Area. Searches of the EPBC Act PMST and *NatureMap* databases identified the presence/potential presence of 57 conservation significant fauna species within 20 km of the Clearing Area. A likelihood of occurrence assessment considered that the Clearing Area would provide habitat for: • 34 migratory / marine birds • Nine (9) BC Act and EPBC Act listed birds (many of which are also listed as marine / migratory and included in the 34 species above) • One reptile, *Ctenotus angusticeps* (Priority 3, Vulnerable – EPBC Act) None of the PECs identified in the desktop searches are likely to occur within the Clearing Area. The Clearing Area is unlikely to comprise greater biological diversity than the surrounding areas. Clearing is not likely to be at variance to this Principle.	The proposed clearing is unlikely to be at variance to this principle.	DBCA TPFL and WAHERB databases EPBC Act Protected Matters Search Tool (DEE 2018b) NatureMap (DBCA 2007-)
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	A search of the *NatureMap* databases identified 651 fauna species (including 12 naturalised/introduced species) previously recorded within 20 km of the Clearing Area. Searches of the EPBC Act PMST and *NatureMap* databases identified the presence/potential presence of 57 conservation significant fauna species within 20 km of the Clearing Area. A likelihood of occurrence assessment considered that the Clearing Area would provide habitat for:	The proposed clearing may be at variance to this principle	EPBC Act Protected Matters Search Tool (DEE 2018b) NatureMap (DBCA 2007-)

Principle	Assessment	Outcome	References
	• 34 migratory / marine birds • Nine (9) BC Act and EPBC Act listed birds (many of which are also listed as marine / migratory and included in the 34 species above) • One reptile, *Ctenotus angusticeps* (Priority 3, Vulnerable – EPBC Act) The inter-tidal flats are typically characterised by rich and diverse fauna of burrowing invertebrates, and are a habitat for migratory birds that use the mud flats as feeding grounds (Pilbara Corridors, 2016). The reptile *Ctenotus angusticeps* (Airlie Island Skink) is likely to occur within the Clearing Area. While no mangroves will be cleared for this Project, the Clearing Area is near the Nickol River tidal system and mangrove communities exist along the northern and eastern border. There is a risk that clearing could increase the risk of sediment export during peak tides / cyclonic events that could potentially impact on the mangrove system. The Project may be at variance to this Principle.		
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No EPBC Act and/or BC Act listed flora have been identified from desktop searches within Clearing Area. The Clearing Area is considered unlikely to include or be necessary for the continued existence of rare/threatened flora.	The proposed clearing is unlikely to be at variance to this principle	DBCA TPFL and WAHERB databases EPBC Act Protected Matters Search Tool (DEE 2018b) NatureMap (DBCA 2007-)
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	No EPBC Act and/ or BC Act TECs have been identified within 20 km of the Clearing Area. The Clearing Area is considered unlikely to comprise of, or is necessary for the maintenance of, a TEC.	The proposed clearing is unlikely to be at variance to this principle	DBCA TEC dataset EPBC Act Protected Matters Search Tool (DEE 2018b) NatureMap (DBCA 2007-)
(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	The Clearing Area is located within the Pilbara bioregion and Roubourne subregion as described by the IBRA. Broad scale (1:1,000,000) pre-European vegetation mapping of the Pilbara region was completed by Beard (1975) at an association level. The mapping indicates that one vegetation association is present within the Clearing Area – Tidal mud flat (vegetation association 127).	The proposed clearing is unlikely to be at variance to this principle	Shepherd et al. (2002) GoWA (2018a)

Principle	Assessment	Outcome	References
	The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the DBCA – latest update December 2017 (GoWA 2018a).The current extents remaining of vegetation association 127 at the State, IBRA bioregion, IBRA subregion and LGA levels are greater than 87% of the calculated pre European extents.		
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The Clearing Area is located on a tidal mud flat to the south of a creekline which drains to Nickol Bay to the east. Based on inspection of aerial images drainage channels occur across the Clearing Area and creek-lines with mangrove vegetation occur on the northern and eastern border of the Clearing Area. The Clearing Area is located an area likely to be subject to inundation following significant rainfall / cyclonic events / peak tides or storm surges. The Project will involve construction of a sea wall and filling of the site to construct the algae ponds and associated infrastructure. During the construction phase there may be a risk, under peak tides, cyclonic or high rainfall conditions, for sediments to be exported to these drainage lines and ultimately to Nickol Bay. Based on the above information the proposed clearing may be at variance to this Principle.	The proposed clearing may be at variance to this Principle	Aerial imagery – Landgate WA Now (2018)
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The Clearing Area is located in an area of high risk of ASS which, if disturbed without appropriate management and treatment of soils, may cause appreciable land degradation. However the Project will involve construction of a sea wall and filling of the site rather than cut of in situ soils and therefore minimal to no disturbance of ASS is expected. If there is a requirement to disturb ASS appropriate investigations and ASS management strategies will be implemented as per relevant DWER guidelines. Contamination has previously been identified within Lot 267. Based on the information outlined within the DWER BSR for Lot 267 it is unknown as to the exact location of contamination extent and previous investigations. During the construction and operational phase there is the potential for the mud flat to be subject to wind erosion and export of sediments during peak tides and cyclonic events into Nickol Bay. These mud flats may also be prone to water-logging during periods of peak tides or overland flows. The design and construction methodology will	The proposed clearing may be at variance to this Principle	Aerial imagery – Landgate WA Now (2018)

Principle	Assessment	Outcome	References
	consider these impacts and include management measures to prevent the export of material off-site into the adjacent Nickol Bay. Furthermore, pollution impacts from the storage and handling of chemicals and hydrocarbons (during the construction / operational phase) will be managed to prevent pollution of soil and drainage lines. The Project may be at variance to this Principle. However it is considered that this impact may minimised through final design, construction methodologies and implementing an EMP.		
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	No conservation areas are located within or immediately adjacent to the Clearing Area. The closest DBCA managed land is located approximately 5 km north west of the Clearing Area. It is considered that the proposed clearing is unlikely to impact on the environmental values of the area.	The proposed clearing is unlikely to be at variance to this principle	Aerial imagery – Landgate WA Now (2018)
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The Clearing Area is located on a tidal mud flat to the south of a creekline which drains to Nickol Bay to the east. The Clearing Area is not located within a Public Drinking Water Supply Area. The Clearing Area is located in an area of high risk of ASS which, if disturbed without appropriate management and treatment of soils, may cause deterioration in the quality of surface or underground water. However, the Project will involve construction of a sea wall and filling of the site rather than cut of in situ soils and therefore minimise disturbance of ASS. If there is a requirement to disturb ASS, appropriate investigations and ASS management strategies will be implemented as per relevant DWER guidelines. Contamination has previously been identified within Lot 267. Based on the information outlined within the DWER BSR for Lot 267 it is unknown as to the exact location of contamination extent and previous investigations. Clearing of vegetation and disturbance of contaminated soils and groundwater during the construction phase may result in deterioration of surface or groundwater quality and therefore may be at variance to this Principle.	The proposed clearing may be at variance to this Principle	Aerial imagery – Landgate WA Now (2018)
(j) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The Clearing Area is located on a tidal mud flat to the south of a creekline which drains to Nickol Bay to the east. The Clearing Area is located an area likely to be subject to inundation following significant rainfall or cyclonic events. The area occurs within the City of Karratha (DP 19) flood risk extent, with the mapping indicated that the 100 yr ARI flood depth (based on the 2010 climate scenario) for the Project	The proposed clearing is unlikely to be at variance to this principle	Aerial imagery – Landgate WA Now (2018)

Principle	Assessment	Outcome	References
	would be greater than 2 m. The Storm Surge Vulnerability Maps (provided in City of Karratha, DP 19) show that the Project would likely be in an area of greater than 3.5 m (500 Yr ARI Surge Inundation Depth). As the Clearing Area occurs on a tidal area that is vulnerable to storm surges, it is considered that the proposed clearing may increase the risk of short term flooding following permits of heavy rainfall / cyclonic events or peak tides.		

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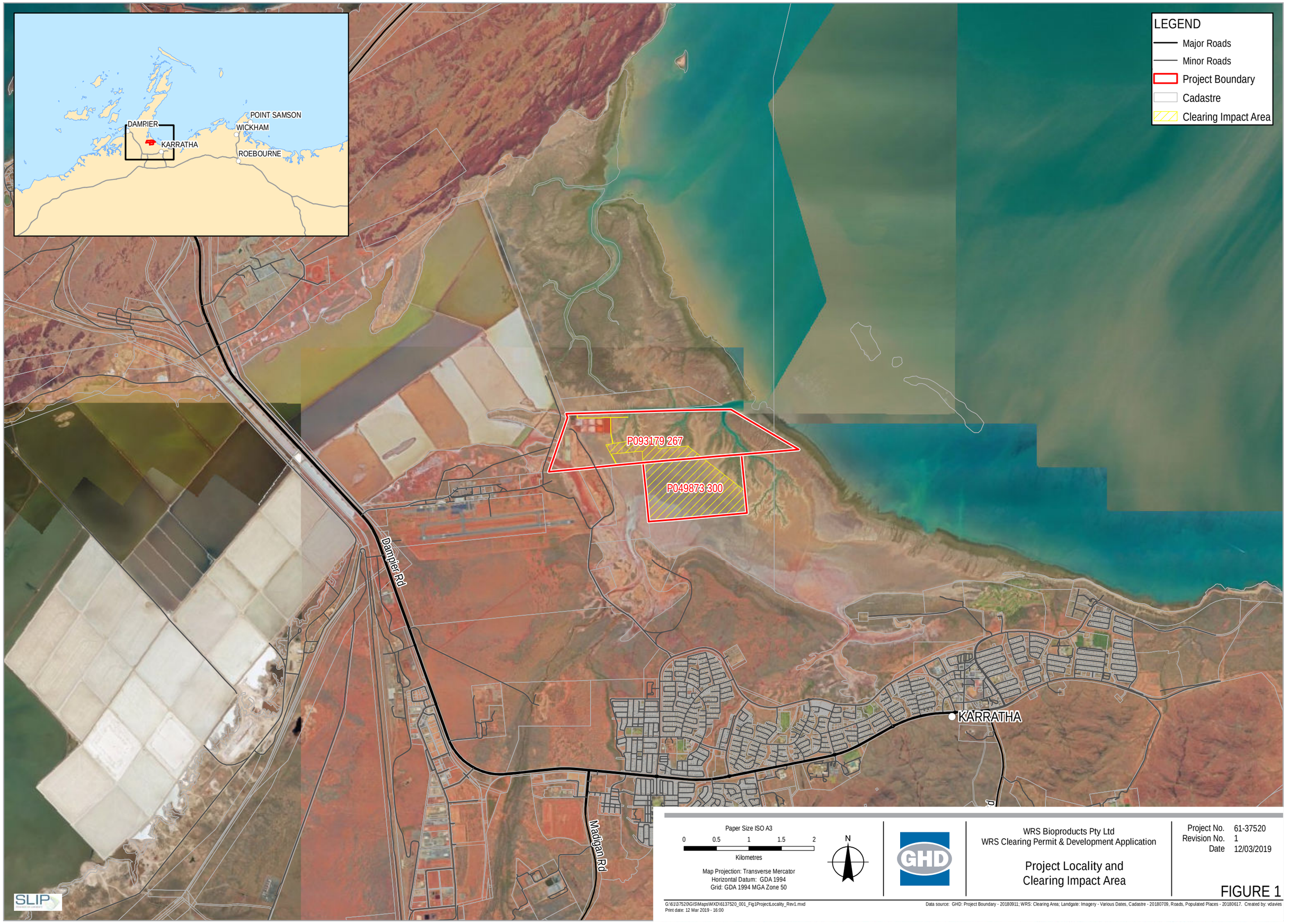
Appendices

Appendix A - Figures



Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

WRS Bioproducts Pty Ltd
WRS Clearing Permit & Development Application

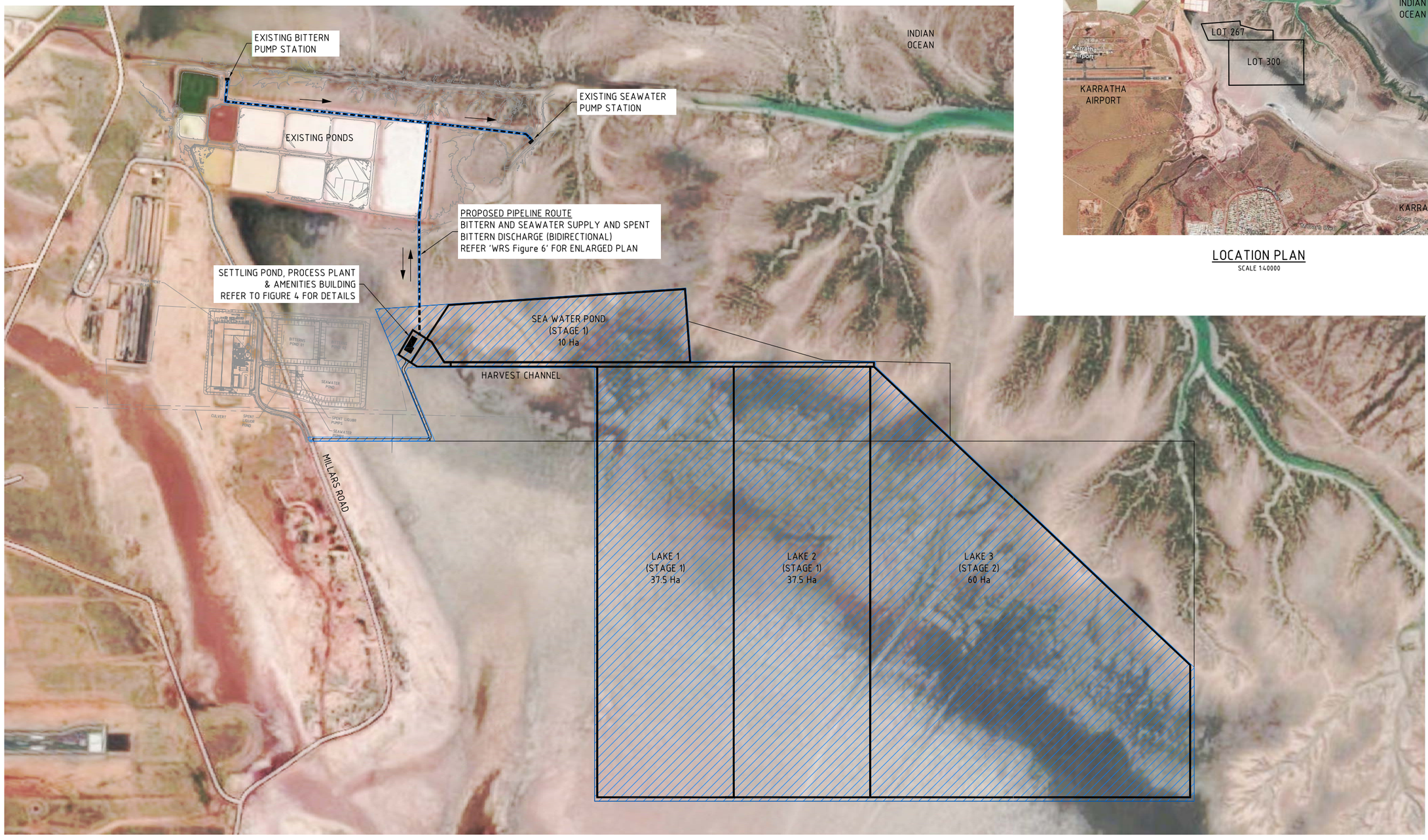
Project Locality and Clearing Impact Area

Project No. 61-37520
Revision No. 1
Date 12/03/2019

FIGURE 1

G:\61\37520\GIS\Maps\MXD\6137520_001_Fig1ProjectLocality_Rev1.mxd
Print date: 12 Mar 2019 - 16:00

Data source: GHD: Project Boundary - 20180911; WRS: Clearing Area; Landgate: Imagery - Various Dates, Cadastre - 20180709, Roads, Populated Places - 20180617. Created by: vdavies



SITE PLAN
SCALE 1:5000

LOCATION PLAN
SCALE 1:40000

LEGEND

PROPOSED CLEARING AREA

DESIGNED:

THE PROJECT OFFICE
CONSULTING ENGINEERS, DESIGN & CONSTRUCTION

CLIENT: WRS Bioproducts

REFERENCES

DRG. No.	TITLE

REVISIONS

No.	BY	DATE	CHK	APP	DESCRIPTION
B	TS	10.12.18	BC		PRELIMINARY
A	TS	21.11.18	BC		PRELIMINARY

ALL DIMENSIONS IN MILLIMETRES U.N.O.
DO NOT SCALE

SCALE : 1:5000

	NAME	DATE
DESIGNED	B. CASSIN	21.11.18
DRAWN	T. SVATIK	21.11.18
CHECKED		
APPROVED OP		
APPROVED PE		
APPROVED MS/MM		

THE PROJECT OFFICE

WRS BIOPRODUCTS PTY LTD
CONCEPTUAL SITE UTILISATION - RAINSTORM LEASE
ALGAL PONDS & PROCESSING PLANT
SITE PLAN - PROPOSED CLEARING AREA

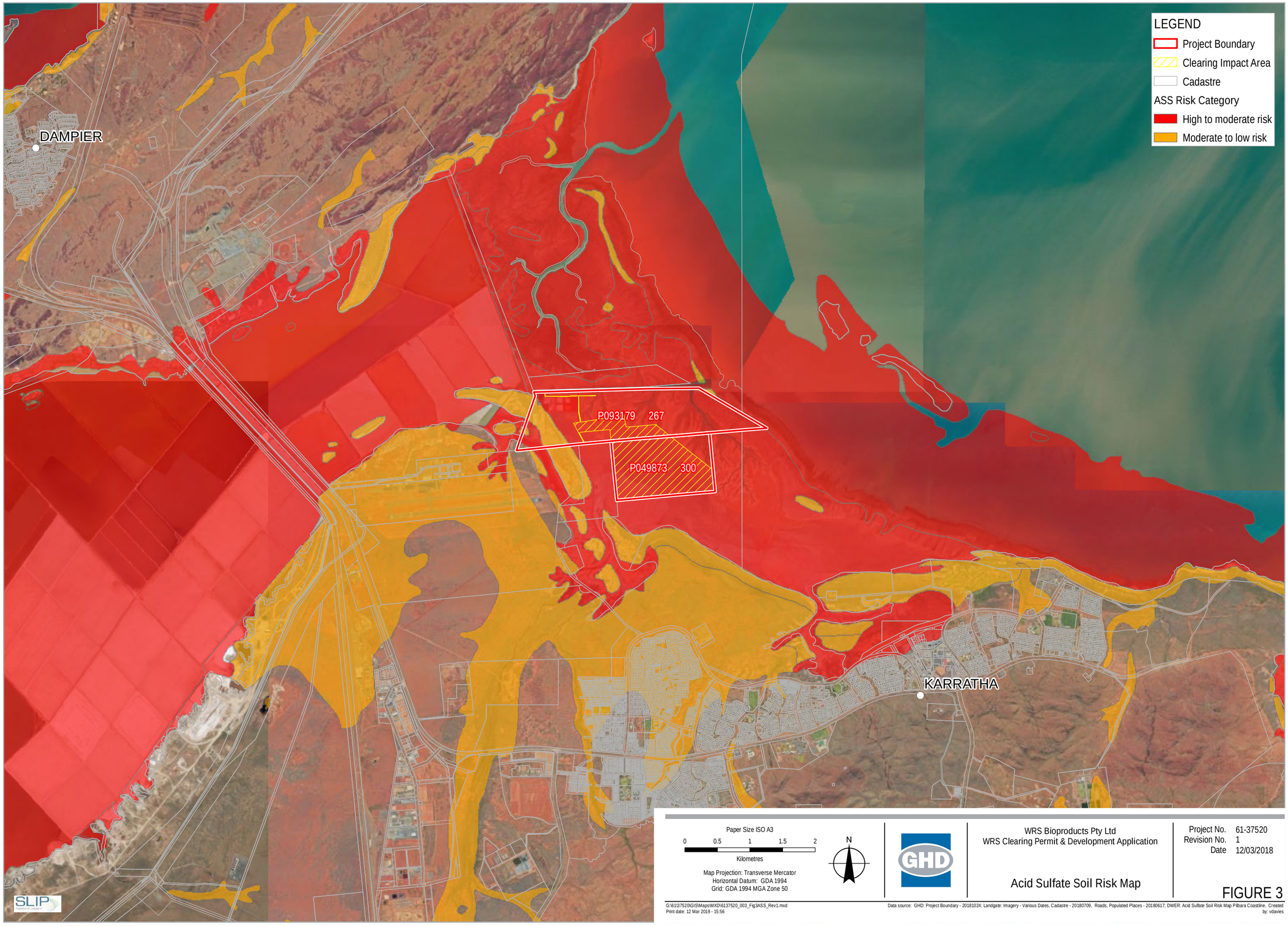
DRAWING NUMBER

Figure 5

DRG. REV.: A B
M/F
A1

10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150mm

Consultants No:



Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

WRS Bioproducts Pty Ltd
WRS Clearing Permit & Development Application

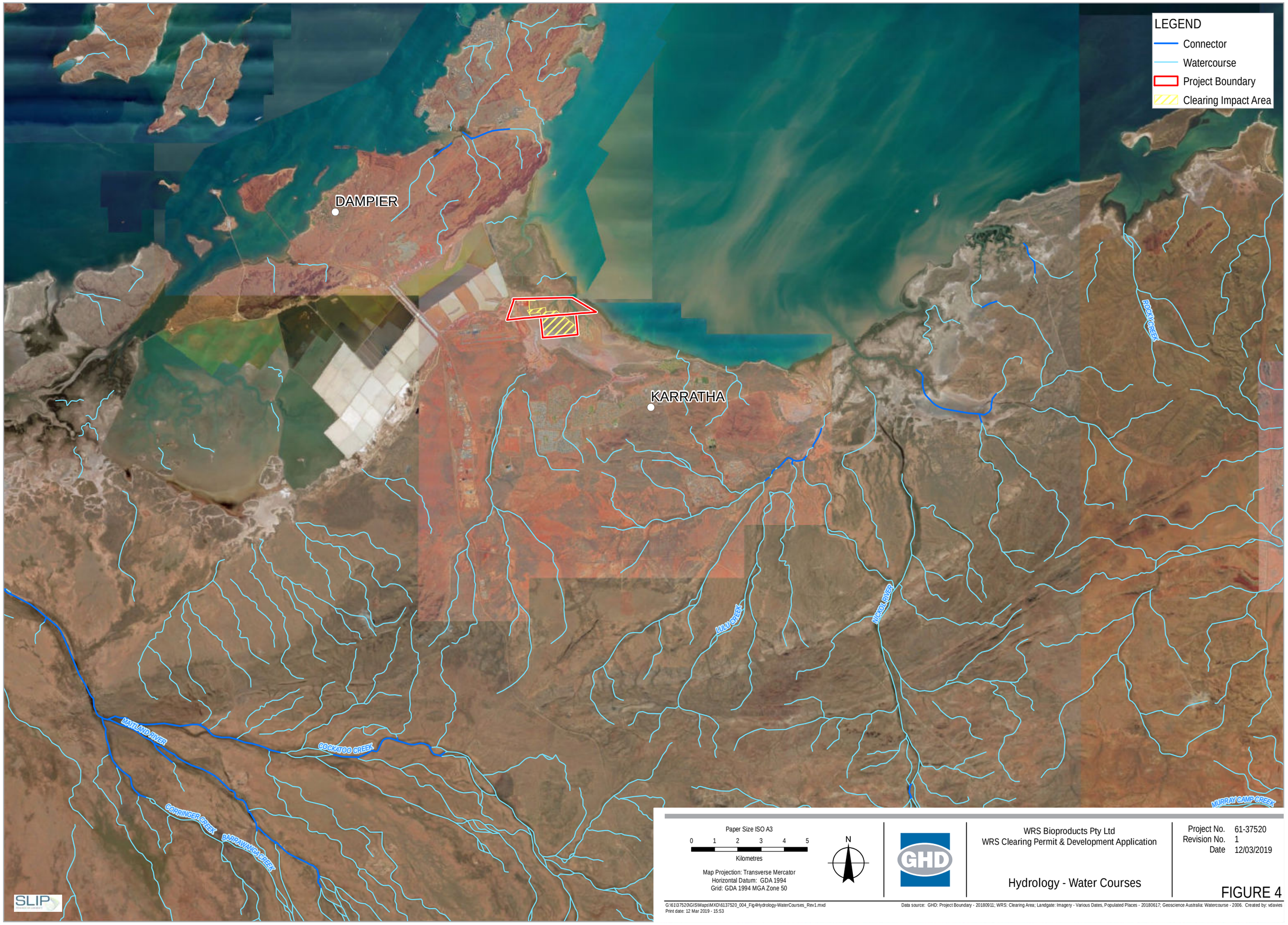
Acid Sulfate Soil Risk Map

Project No. 61-37520
Revision No. 1
Date 12/03/2018

FIGURE 3

G:\61\37520\GIS\Maps\MXD\6137520_003_Fig3ASS_Rev1.mxd
Print date: 12 Mar 2019 - 15:56

Data source: GHD: Project Boundary - 20181024; Landgate: Imagery - Various Dates, Cadastre - 20180709, Roads, Populated Places - 20180617; DWER: Acid Sulfate Soil Risk Map Pilbara Coastline. Created by: vdavies



Paper Size ISO A3

0 1 2 3 4 5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

WRS Bioproducts Pty Ltd
WRS Clearing Permit & Development Application

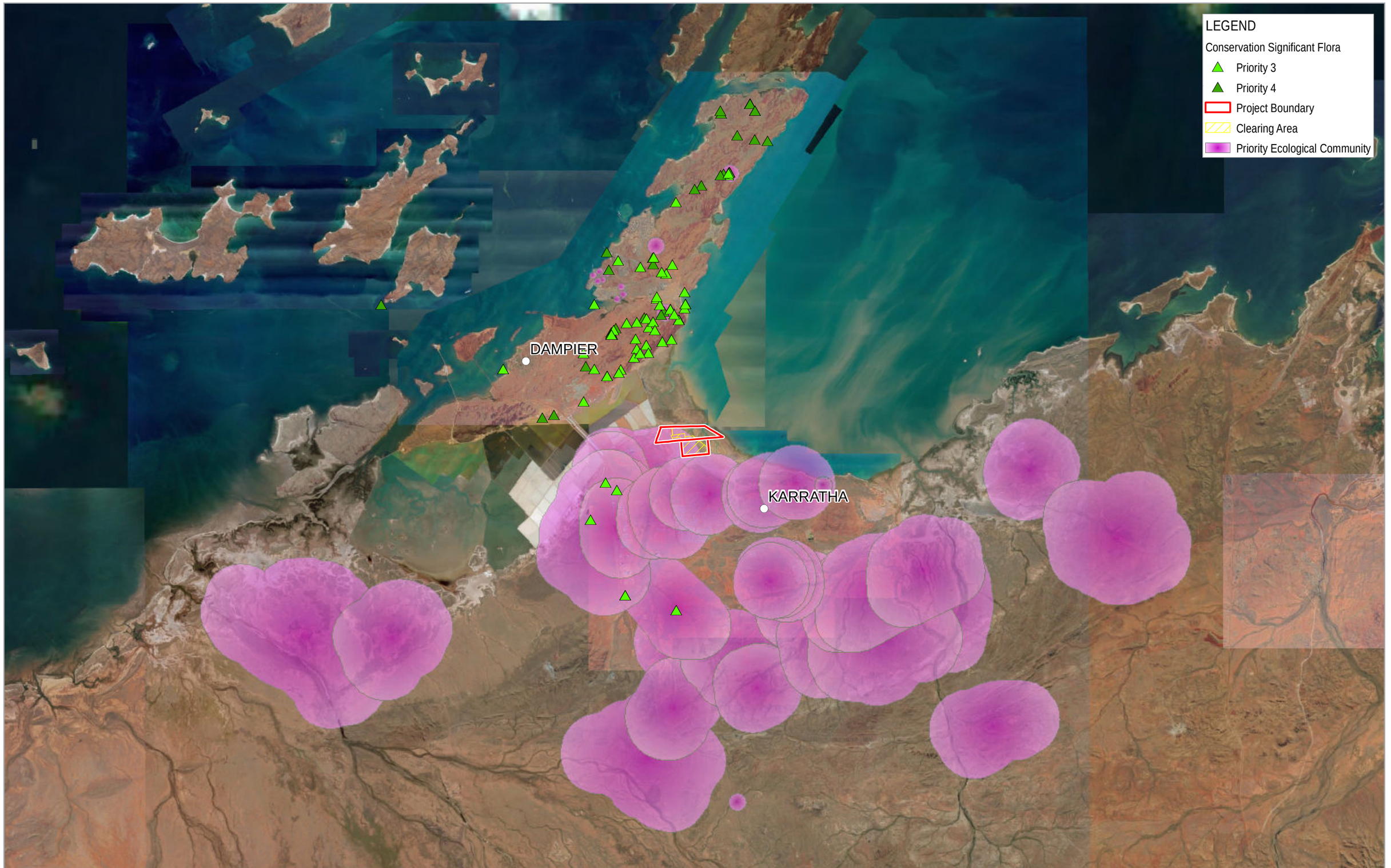
Hydrology - Water Courses

Project No. 61-37520
Revision No. 1
Date 12/03/2019

FIGURE 4

G:\61\37520\GIS\Maps\MXD\6137520_004_Fig4Hydrology-WaterCourses_Rev1.mxd
Print date: 12 Mar 2019 - 15:53

Data source: GHD: Project Boundary - 20180911; WRS: Clearing Area; Landgate: Imagery - Various Dates, Populated Places - 20180617; Geoscience Australia: Watercourse - 2006. Created by: vdavies



Paper Size ISO A3

0 1 2 3 4 5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

WRS Bioproducts Pty Ltd
WRS Clearing Permit & Development Application

Threatened & Priority Flora & Vegetation Communities 20km Buffer

Project No. 61-37520
Revision No. 1
Date 12/03/2019

FIGURE 5

G:\61\37520\GIS\Maps\MXD\6137520_005_Fig5TECPECFlora_Rev0.mxd
Print date: 12 Mar 2019 - 15:51

Data source: GHD: Project Boundary - 20181024; WRS: Clearing Area; Landgate: Imagery - Various Dates; DBCA: TEC/PEC, WA Herb and TPFL - 20180917. Created by: vdavies

Appendix B — DWER Basic Summary of Records

Government of **Western Australia**
Department of **Environment Regulation**

Your ref	GK267
Our ref	DMO 3332
Enquiries	Registrar
Phone	1300 762982
Fax	
Email	

Robert Kerr
Rainstorm Dust Control Pty Ltd
106 Maddington Road
Maddington WA 6109

Dear Sir/Madam

BASIC SUMMARY OF RECORDS REQUEST

Thank you for your Basic Summary of Records (BSR) request for the site consisting of the following parcel(s) of land:

- Parcel 65225 - LOT 267 ON PLAN 93179 as shown on certificate of title LR3013/889 known as Gap Ridge WA 6714 (Landgate PIN 1108290)
- Parcel 65226 - LOT 267 ON PLAN 93179 as shown on certificate of title LR3013/889 known as Gap Ridge WA 6714 (Landgate PIN 705501)

which Department of Environment Regulation (DER) received on 13/06/2016

A search of DER's records of known and suspected contaminated sites was undertaken and the results of the search are attached for your information. The parcels identified above share the same classification; hence one 'Basic Summary of Records Search Response' is attached.

General information on a Summary of Records and associated request forms is available from DER's website on www.der.wa.gov.au/contaminatedsites or by contacting the Registrar on 1300 762 982.

Yours sincerely

Andrew Miller, Senior Manager

CONTAMINATED SITES
Delegated Officer under section 91
of the *Contaminated Sites Act 2003*

08/07/2016

Enc. Basic Summary of Records
Receipt Number DER50939

Licensing and Approvals, Contaminated Sites
Postal Address: **Locked Bag 33, Cloisters Square WA 6850**
Ph: 1300 762 982 Fax: (08) 9333 7575
contaminated.sites@der.wa.gov.au
www.der.wa.gov.au

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:50:25PM, 08/07/2016

Receipt No: DER50939

ID No: 65225

Search Results

This response relates to a search request received for:

Lot 267 On Plan 93179
Gap Ridge, WA, 6714

This parcel belongs to a site that contains 13 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

Address	Lot 267 On Plan 93179 Gap Ridge, WA, 6714
Lot on Plan Address	Lot 267 On Plan 93179
Parcel Status	**Classification:** 16/09/2015 - *Possibly contaminated - investigation required* **Nature and Extent of Contamination:** A disposal channel for bitterns (a waste product from salt disposal, typically rich in metal salts) is present in the area (known as Area 18), discharging into Nickol Creek. Surface water investigations carried out in 2010 did not identify evidence of contamination in this area, but further sampling was recommended and has not yet been carried out. No sediment sampling has been carried out in this area, and the quality of sediments is unknown. **Restrictions on Use:** Please refer to the Reasons for Classification for further information on the contamination present at the site. The Site Management Plan dated February 2015 should be applied at this site. Hydrocarbons (such as from petrol or diesel) are known to be present in groundwater in Areas 2, 3, 7, 8, 13 and 30. In these locations, groundwater abstraction is not permitted other than for analytical testing or remediation; no new buildings should be constructed without assessment for potential vapour intrusion risks; and DER recommends that a site-specific health and safety plan be developed for any intrusive excavations. In all other areas, in accordance with Department of Health advice, if groundwater is being, or is proposed to be abstracted, DER recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use. **Reason for Classification:**

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:50:25PM, 08/07/2016

This site was reported to the Department of Environment Regulation (DER) as per reporting obligations under section 11 of the 'Contaminated Sites Act 2003' (the Act), which commenced on 1 December 2006.

The site was first classified under section 13 of the Act based on information submitted to DER by February 2009. The site has been classified again under section 13 of the Act to reflect additional technical information submitted to DER by April 2015.

The Site was reported because it has been used as a purpose built evaporation facility for solar salt manufacturing, which contains areas such as former landfills, workshops, fuel farms, plant and support facilities and effluent disposal areas, for approximately 47 years since 1968.

Fuel storage, mechanical workshops, waste disposal and mining are land uses that have the potential to cause contamination, as specified in the guideline 'Assessment and management of contaminated sites' (DER, 2014).

A series of contamination assessments were carried out between April 2009 and February 2015. The assessments described several potential areas of concern, described as 'Area 1' to 'Area 30'. The majority of areas are collectively known as the 'Main Salt Production Facility', located on the mainland between Dampier and Karratha.

This classification covers most of the Main Salt Production Facility located on mining tenements TR70/5461 and ML 253SA, and on a number of cadastral parcels including Lot 264 on Deposited Plan 220363, Lot 267 on Plan 93179, Lot 322 on Plan 42624 and Lot 677 on Plan 32809.

Lots 318 and 319 on Plan 42300 (Areas 15, 16 and 17) and Lot 79 on Plan 241957 (Areas 19 and 20, known as Eastern Middle Island and Mistaken Island respectively) have been classified separately under the Act.

As a solar salt manufacturing facility, the site is currently licensed under Part V of the 'Environmental Protection Act 1986' (licence 7182/9), with monitoring and management requirements.

Salt ponds

The majority of the site comprises ponds and channels used for solar salt manufacture. Information provided to DER, which has comprised investigations carried out in the context of the site's ongoing land use for salt mining, did not consider the contamination status of these areas. The quality of soil, groundwater, surface water and sediment in these areas is unknown.

Areas 1, 4, 5, 6 and 12

Land uses include offices (Area 1), mechanical workshops (Area 1, Area 4, Area 5); fuel storage (Area 1, Area 5); degreaser storage (Area 6); and mechanical equipment storage (Area 12).

A site walkover carried out as part of the Preliminary Site Investigation (PSI) did not identify any indications of contamination in these areas. However, the PSI was carried out in the context of ongoing commercial/industrial land use only. No soil or groundwater investigations have been carried out, and the quality of soil and groundwater in these areas is unknown.

Area 2: Boilermakers workshop

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:50:25PM, 08/07/2016

Land uses in Area 2 include a steel fabrication workshop and paint storage. A site walkover carried out as part of the PSI observed oil staining on surface soils in this area.

Soil investigations carried out in 2010 as part of a Detailed Site Investigation (the 2010 DSI) found hydrocarbons (such as from diesel) were present at concentrations exceeding ecological investigation levels (EILs) and health-based investigation levels for commercial and industrial sites (HIL-F), as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment and Conservation (DEC), 2010), which is a guideline that was applicable at the time the investigations were carried out.

Groundwater investigations were carried out in 2010 and 2014. Hydrocarbons (such as from petrol or diesel) were detected at concentrations exceeding non-potable groundwater use (NPUG) criteria and exceeding Groundwater Investigation Levels (GILs) for fresh water and/or marine water ecosystems, as published in the guideline 'Assessment and management of contaminated sites' (DER, 2014).

A 2014 Detailed Site Investigation (the 2014 DSI) found that hydrocarbon impact in this area was unlikely to extend more than 10 metres from the workshop. However, the 2014 groundwater monitoring event (the 2014 GME) concluded that groundwater monitoring could not demonstrate a clear trend in contaminant concentrations.

A Site Management Plan (SMP), dated February 2015, applies to this area of the site.

Area 3: Vehicle wash down area

A site walkover in Area 3 (known as the vehicle wash down area) carried out in 2009 observed vehicle wash down, the use of degreasers, an oil/water separator, waste oil collection and storage and oil staining on the outside of the bund for the waste oil tank.

Soil investigations carried out in 2010 found hydrocarbons (such as from diesel) were present at concentrations exceeding EILs and HIL-F, (DEC, 2010), which are criteria that were applicable at the time the investigations were carried out.

Hydrocarbons (such as from diesel), lead and nickel were present in groundwater in 2010 and 2014, at concentrations exceeding NPUG criteria and GILs for marine water ecosystems (DER, 2014). Concentrations appeared to be declining and results indicated that contamination was localised.

An SMP dated February 2015 applies to this area of the site.

Area 7: Main workshop and oil store

Land uses in this area include a mechanical workshop and bulk fuel storage. Fuel staining was observed on surface soils near the workshop entrance in 2014. A small unlined pit to the south-west of the workshop is used to discharge oily water through a triple interceptor trap and oil water separator unit.

Soil investigations carried out in 2010 found hydrocarbons (such as from diesel) were present at concentrations exceeding EILs and HIL-F, (DEC, 2010), which are criteria that were applicable at the time the investigations were carried out.

Hydrocarbons (such as from petrol) and metals (lead, copper, nickel, zinc) were present in groundwater in 2010, 2013 and 2014, at concentrations exceeding NPUG criteria and GILs for fresh

water and marine water ecosystems (DER, 2014). Concentrations appeared to decline in 2014.

Soil vapour investigations were carried out in 2014, to assess potential vapour intrusion risk related to high concentrations of volatile hydrocarbons in groundwater. Hydrocarbons (benzene and naphthalene) were detected in soil vapour, but not in groundwater at the closest location, suggesting the result may have been related to cross-contamination from other sources such as fuel storage within the workshop.

Comparison of groundwater results from 2014 to health screening levels for commercial and industrial sites, as published in the 'National Environmental Protection (Assessment of Site Contamination) Measure 1999' (the NEPM), indicates there is not likely to be a health risk for site workers related to petroleum vapour intrusion in this area of the site. However, a risk assessment carried out in 2014 concluded that there may be a health risk for workers undertaking any intrusive excavations, such as when accessing below-ground services. Any risk is likely to diminish over time.

An SMP dated February 2015 applies to this area of the site.

Area 8: Light vehicle refuelling area

Bulk fuel storage occurs in this area, including two diesel above-ground storage tanks, now understood to be decommissioned, and one new 52 kL AST. Hydrocarbon staining was observed in surface soils near a triple interceptor and drain in this area in 2009.

Soil investigations carried out in 2010 found hydrocarbons (such as from diesel) were present at concentrations exceeding EILs and HIL-F, (DEC, 2010), which are criteria that were applicable at the time the investigations were carried out.

Hydrocarbons (such as from diesel) were present in groundwater at concentrations exceeding NPUG criteria and GILs for fresh water ecosystems (DER, 2014). Concentrations appeared to decline between 2010 and 2014.

An SMP dated February 2015 applies to this area of the site.

Area 9: Plant and vehicle wash down

A combination of groundwater and sea water is used to wash salt from equipment and vehicles in this area.

The PSI, and soil and groundwater investigations carried out in 2010 and 2014, did not identify any indications of contamination. However, the assessments were carried out in the context of ongoing commercial/industrial land use only.

Area 10: Biopit

The PSI and the 2010 DSI identify this area as being in two different locations. Clarification should be provided to DER.

Area 10 is used for land farming hydrocarbon contaminated materials (i.e. soil collected from fuel spills). DER understands that the area is bunded.

Soil and groundwater investigations carried out between 2010 and 2014 did not identify any

indications of contamination. However, the assessments were carried out in the context of ongoing commercial/industrial land use only.

An SMP dated February 2015 applies to this area of the site.

Area 11: Sand blasting yard

The PSI and the 2010 DSI identify this area as being in two different locations. Clarification should be provided to DER.

Area 11 is used for cleaning mechanical equipment.

Blasting residue was observed on surface soils in this area in 2009. However, no soil investigations have been carried out, and the quality of soil in this area is unknown.

A groundwater investigation carried out in 2014 did not identify any indications of contamination. However, the assessment was carried out in the context of ongoing commercial/industrial land use only.

Area 13: Road train refuelling area

Three diesel ASTs were present in Area 13 in 2009, but DER understands that the facility has now been decommissioned.

Soil investigations carried out in 2010 found hydrocarbons (such as from diesel) were present in Area 13 at concentrations exceeding EILs and HIL-F (DEC, 2010), which are criteria that were applicable at the time the investigations were carried out.

Light non-aqueous phase liquid (LNAPL), such as pure diesel, was observed floating on the surface of groundwater in 2010. The concentration of dissolved hydrocarbons in groundwater in 2014 indicated that LNAPL was likely to remain at the site (e.g. pure diesel may be floating in groundwater, or present in soil beneath the groundwater table).

An SMP dated February 2015 applies to this area of the site.

Area 14: Salt dissolution pond

A brine/oil separator, comprising two ponds and a culvert channel, is present in this area and is used to skim oil from contaminated brine waters.

Soil investigations carried out in 2010 found a metal (copper) at a concentration exceeding EILs (DEC, 2010), which are criteria that were applicable at the time the investigations were carried out.

Groundwater investigations carried out in 2010 and 2014 found metals (copper, nickel and zinc) at concentrations exceeding GILs for fresh water and marine water ecosystems (DER, 2014). Concentrations of copper were two orders of magnitude greater than GILs. Total dissolved solids (TDS) were also elevated at this location.

Area 18: Bitterns disposal

A disposal channel for bitterns (a waste product from salt disposal, typically rich in metal salts) is

present in Area 18, discharging into Nickol Creek.

Surface water investigations carried out in 2010 did not identify evidence of contamination in this area, with the exception of a metal (lead) present at concentrations exceeding GILs for fresh water and marine water ecosystems (DER, 2014). However, quality assurance and quality control sampling indicated that the result may have been due to sampling equipment contamination.

The 2010 DSI recommended further surface water sampling in this area to characterise temporal changes in water quality. However, no further sampling was carried out.

No sediment sampling has been carried out in this area, and the quality of sediments is unknown.

Areas 21 and 22: Landfills

Two former landfills were identified as being present in Areas 21 and 22 during the 2010 DSI. Very little information is available with regard to the types of waste, ages, boundaries or linings of the landfills.

Soil investigations carried out in 2010, and groundwater investigations carried out in 2014, did not identify any contamination. However, these investigations were only carried out in the context of ongoing commercial or industrial land use. Groundwater investigations did not include all potential types of contaminants (such as nutrients) and no landfill gas assessments have been carried out.

Area 23: Vehicle wash down area

The vehicle wash down bay comprises a concrete pad without a bund, such that run-off discharges onto unsealed ground. A triple interceptor is also present in this area, but the discharge location is unknown.

Soil investigations carried out in 2010 and 2014 did not identify any contamination. However, investigations were only carried out in the context of ongoing commercial or industrial land use. Groundwater investigations were not carried out, and the quality of groundwater in this area is unknown.

Area 30: Old power station

A former diesel power station was present in this area, and has now been decommissioned. Very little information was available as to historical operations.

Investigations carried out in 2010 and 2014 observed hydrocarbon odours or visible staining in soils between three and 4.5 metres below ground level, and found that hydrocarbons (such as from diesel) were present in soil at concentrations exceeding EILs and HIL-F (DEC, 2010), which are criteria that were relevant at the time the investigations were carried out.

Hydrocarbons (such as from diesel) were present in groundwater at concentrations exceeding NPUG and GILs for fresh water and marine water ecosystems (DER 2014).

Concentrations of hydrocarbons appeared to have decreased during 2014. A metal (nickel) was present at concentrations exceeding GILs for marine water ecosystems (DER 2014).

An SMP dated February 2015 applies to this area of the site.

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:50:26PM, 08/07/2016

Site classification:

Concentrations of contaminants have been found to exceed adopted assessment levels. A tier 1 screening risk assessment has therefore indicated that further investigation is required to determine the risk to the environment and environmental values.

Based on the information provided, the site appears suitable for continued commercial/industrial use, but may not be suitable for more sensitive land uses (such as residential housing, or child care centres).

As there are grounds to indicate possible contamination of the site and surface water, sediment and groundwater has not been fully investigated, the site is classified as 'possibly contaminated - investigation required'.

DER, in consultation with the Department of Health, has classified this site based on the information available to DER at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DER, and as such, the usefulness of this information may be limited.

Action Required:

Clarification should be provided to DER as to the locations of each area investigated, in relation to spatial and cadastral boundaries. DER recommends the use of interest-only deposited plans for operating areas of the site.

The majority of the site comprises ponds and channels used for solar salt manufacture. In several areas of the site, groundwater was found to contain elevated concentrations of salts or metals. Future investigations should consider the potential for point sources of dissolved salts to have caused soil, groundwater, surface water or sediment contamination.

Further surface water and sediment investigations should be carried out in Area 18, in accordance with the recommendations of the 2010 DSI, to assess the potential temporal variation in surface water quality related to bitterns discharge.

Further groundwater investigations should be carried out in Areas 21 and 22, to assess the potential for contamination related to historical land filling activities.

The Site Management Plan dated February 2015 should be implemented.

Investigations should be carried out in accordance with DER's 'Contaminated Sites Guidelines' (2014) and the 'National Environment Protection (Assessment of Site Contamination) Measure 1999'.

DER notes that the site continues to be used for activities related to mining, which is a land use that has the potential to cause contamination, as specified in the guideline 'Assessment and Management of Contaminated Sites' (DER, 2014). For this reason, DER recommends that further assessment of potential contamination should be undertaken at mine closure, or before any change in land use to a more sensitive land use (such as residential, primary school or childcare centre) in the future.

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:50:26PM, 08/07/2016

Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "possibly contaminated - investigation required". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Environment Regulation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** *Nil* **Date Issued:** *Nil*
General	No other information relating to this parcel.

Appendix C – NatureMap and EPBC Act Search Results

NatureMap Species Report

Created By Guest user on 25/10/2018

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	116° 48' 03" E,20° 42' 10" S
Buffer	20km
Group By	Species Group

Species Group	Species	Records
Alga	56	148
Amphibian	4	50
Bird	206	5651
Bryopsid (Moss)	1	1
Dicotyledon	436	1649
Fish	88	103
Fungus	2	2
Hepatic (Liverwort)	1	1
Invertebrate	173	373
Lichen	6	7
Mammal	44	406
Monocotyledon	87	297
Pteridophyte (Fern)	2	5
Reptile	102	1063
TOTAL	**1208**	**9756**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Alga					
1.	26441	*Acanthophora spicifera*			
2.	48409	*Acetabularia caliculus*			
3.	26462	*Amphiroa fragilissima*			
4.	35872	*Anadyomene plicata*			
5.	26486	*Asparagopsis taxiformis*			
6.	26508	*Boodlea composita*			
7.	26510	*Bornetella sphaerica*			
8.	35220	*Canistrocarpus cervicornis*			
9.	35910	*Canistrocarpus crispatus*			
10.	42620	*Caulerpa chemnitzia*			
11.	35158	*Caulerpa corynephora*			
12.	47053	*Caulerpa cupressoides var. cupressoides*			
13.	44539	*Caulerpa cylindracea*			
14.	44547	*Caulerpa lamourouxii*			
15.	26568	*Caulerpa lentillifera*			
16.	26573	*Caulerpa racemosa*			
17.	35122	*Caulerpa racemosa var. racemosa*			
18.	26576	*Caulerpa serrulata*			
19.	26577	*Caulerpa sertularioides*			
20.	26579	*Caulerpa taxifolia*			
21.	26582	*Caulerpa verticillata*			
22.		*Codium platyclados*			Y
23.	26694	*Colpomenia sinuosa*			
24.	26740	*Dasya frutescens*			
25.	26764	*Dictyopteris australis*			
26.	29954	*Dictyopteris woodwardia*			
27.	26769	*Dictyosphaeria cavernosa*			
28.	26775	*Dictyota ciliolata*			
29.	26782	*Digenea simplex*			
30.	26835	*Galaxaura rugosa*			
31.	26892	*Halimeda discoidea*			
32.	26894	*Halimeda macroloba*			
33.	47213	*Halimeda versatilis*			
34.	37642	*Halymenia durvillei*			
35.	26930	*Heterosiphonia crassipes*			
36.	26949	*Hydroclathrus clathratus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
37.	27043	*Lobophora variegata*			
38.	27079	*Mychodea carnosa*			
39.	44548	*Neomeris bilimbata*			
40.	27113	*Padina australis*			
41.	48304	*Padina tetrastromatica*			Y
42.	36400	*Palisada perforata*			
43.	27121	*Penicillus nodulosus*			
44.	27248	*Sargassum ligulatum*			
45.	27253	*Sargassum peronii*			
46.	42785	*Sirophysalis trinodis*			
47.	27282	*Spatoglossum macrodontum*			
48.	27293	*Sphacelaria rigidula*			
49.	44523	*Spongophloea tissotii*			
50.	27310	*Spyridia filamentosa*			
51.	27336	*Tolypiocladia glomerulata*			
52.		*Turbinaria mesenterina*			
53.	27346	*Turbinaria ornata*			
54.	27348	*Udotea argentea*			
55.	35302	*Udotea glaucescens*			
56.	27357	*Valoniopsis pachynema*			
Amphibian					
57.	25371	*Cyclorana australis (Giant Frog)*			
58.	25375	*Cyclorana maini (Sheep Frog)*			
59.	25392	*Litoria rubella (Little Red Tree Frog)*			
60.	25430	*Notaden nichollsi (Desert Spadefoot)*			
Bird					
61.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
62.	25536	*Accipiter fasciatus (Brown Goshawk)*			
63.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
64.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
65.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
66.	24312	*Anas gracilis (Grey Teal)*			
67.	24316	*Anas superciliosa (Pacific Black Duck)*			
68.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
69.	24505	*Anous stolidus subsp. pileatus (Common Noddy)*		IA	
70.	25670	*Anthus australis (Australian Pipit)*			
71.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
72.	24285	*Aquila audax (Wedge-tailed Eagle)*			
73.	25559	*Ardea intermedia (Intermediate Egret)*			
74.	41324	*Ardea modesta (great egret, white egret)*			
75.	24341	*Ardea pacifica (White-necked Heron)*			
76.	24610	*Ardeotis australis (Australian Bustard)*			
77.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
78.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
79.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
80.	24354	*Artamus leucorynchus subsp. leucopygialis (White-breasted Woodswallow)*			
81.	24355	*Artamus minor (Little Woodswallow)*			
82.	24356	*Artamus personatus (Masked Woodswallow)*			
83.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
84.	24318	*Aythya australis (Hardhead)*			
85.		*Barnardius zonarius*			
86.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
87.	47897	*Butorides striata (Striated Heron, Mangrove Heron)*			
88.	25715	*Cacatua roseicapilla (Galah)*			
89.	25716	*Cacatua sanguinea (Little Corella)*			
90.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
91.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
92.	24780	*Calidris alba (Sanderling)*		IA	
93.	25738	*Calidris canutus (Red Knot, knot)*		IA	
94.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
95.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
96.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
97.	24790	*Calidris tenuirostris (Great Knot)*		T	
98.	25600	*Centropus phasianinus (Pheasant Coucal)*			
99.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		IA	
100.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
101.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
102.	24378	*Charadrius veredus (Oriental Plover)*		IA	
103.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
104.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
105.		*Chroicocephalus novaehollandiae*			
106.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
107.	24288	*Circus approximans (Swamp Harrier)*			
108.	24289	*Circus assimilis (Spotted Harrier)*			
109.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
110.	24399	*Columba livia (Domestic Pigeon)*	Y		
111.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
112.	24416	*Corvus bennetti (Little Crow)*			
113.	25593	*Corvus orru (Torresian Crow)*			
114.	24419	*Corvus splendens (House Crow)*			
115.	25701	*Coturnix ypsilophora (Brown Quail)*			
116.	24673	*Coturnix ypsilophora subsp. australis (Brown Quail)*			
117.	24672	*Coturnix ypsilophora subsp. cervina (Brown Quail)*			
118.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
119.	25595	*Cracticus tibicen (Australian Magpie)*			
120.	25596	*Cracticus torquatus (Grey Butcherbird)*			
121.	24322	*Cygnus atratus (Black Swan)*			
122.	25547	*Dacelo leachii (Blue-winged Kookaburra)*			
123.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
124.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
125.	24470	*Dromaius novaehollandiae (Emu)*			
126.		*Egretta garzetta*			
127.		*Egretta novaehollandiae*			
128.		*Elanus axillaris*			
129.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
130.	24631	*Emblema pictum (Painted Finch)*			
131.		*Eolophus roseicapillus*			
132.	24653	*Eopsaltria pulverulenta (Mangrove Robin)*			
133.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
134.	24568	*Epthianura aurifrons (Orange Chat)*			
135.	24570	*Epthianura tricolor (Crimson Chat)*			
136.	24837	*Eremiornis carteri (Spinifex-bird)*			
137.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
138.	47938	*Esacus magnirostris (Beach Stone-curlew, Beach Thick-knee)*			
139.	24368	*Eurostopodus argus (Spotted Nightjar)*			
140.	25621	*Falco berigora (Brown Falcon)*			
141.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
142.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
143.	25623	*Falco longipennis (Australian Hobby)*			
144.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
145.	24476	*Falco subniger (Black Falcon)*			
146.	24478	*Fregata ariel (Lesser Frigatebird)*		IA	
147.	25727	*Fulica atra (Eurasian Coot)*			
148.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
149.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
150.	42314	*Gavicalis virescens (Singing Honeyeater)*			
151.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
152.	24401	*Geopelia cuneata (Diamond Dove)*			
153.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
154.	25585	*Geopelia striata (Zebra Dove)*			
155.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
156.	25530	*Gerygone fusca (Western Gerygone)*			
157.	24276	*Gerygone tenebrosa (Dusky Gerygone)*			
158.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
159.	24443	*Grallina cyanoleuca (Magpie-lark)*			
160.	24484	*Grus rubicunda (Brolga)*			
161.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
162.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
163.		*Haematopus ostralegus*			Y
164.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
165.	25541	*Haliastur indus (Brahminy Kite)*			
166.	24294	*Haliastur indus subsp. girrenera (Brahminy Kite)*			
167.	24295	*Haliastur sphenurus (Whistling Kite)*			
168.	24297	*Hamirostra melanosternon (Black-breasted Buzzard)*			
169.	47965	*Hieraaetus morphnoides (Little Eagle)*			
170.	25734	*Himantopus himantopus (Black-winged Stilt)*			
171.	24491	*Hirundo neoxena (Welcome Swallow)*			
172.	25630	*Hirundo rustica (Barn Swallow)*		IA	
173.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	

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174.	24367	*Lalage tricolor (White-winged Triller)*			
175.	25637	*Larus novaehollandiae (Silver Gull)*			
176.	25638	*Larus pacificus (Pacific Gull)*			
177.	25661	*Lichmera indistincta (Brown Honeyeater)*			
178.	25739	*Limicola falcinellus (Broad-billed Sandpiper)*		IA	
179.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
180.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
181.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
182.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
183.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
184.	24583	*Manorina flavigula (Yellow-throated Miner)*			
185.	24736	*Melopsittacus undulatus (Budgerigar)*			
186.	24598	*Merops ornatus (Rainbow Bee-eater)*			
187.	25542	*Milvus migrans (Black Kite)*			
188.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
189.	25685	*Neochmia ruficauda (Star Finch)*			
190.		*Neopsephotus bourkii*			
191.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
192.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
193.	25742	*Numenius phaeopus (Whimbrel)*		IA	
194.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
195.	24742	*Nymphicus hollandicus (Cockatiel)*			
196.	24497	*Oceanites oceanicus (Wilson's Storm-petrel)*		IA	
197.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
198.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
199.	24620	*Pachycephala lanioides (White-breasted Whistler)*			
200.	25678	*Pachycephala melanura (Mangrove Golden Whistler)*			
201.	24621	*Pachycephala melanura subsp. melanura (Mangrove Golden Whistler)*			
202.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
203.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
204.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
205.	48053	*Pardalotus rubricatus subsp. rubricatus (Red-browed Pardalote)*			Y
206.	25682	*Pardalotus striatus (Striated Pardalote)*			
207.	25687	*Passer domesticus (House Sparrow)*	Y		
208.	24642	*Passer montanus (Eurasian Tree Sparrow)*	Y		
209.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
210.		*Peneoenanthe pulverulenta*			
211.	48060	*Petrochelidon ariel (Fairy Martin)*			
212.	48061	*Petrochelidon nigricans (Tree Martin)*			
213.	25697	*Phalacrocorax carbo (Great Cormorant)*			
214.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
215.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
216.	25699	*Phalacrocorax varius (Pied Cormorant)*			
217.	24411	*Phaps histrionica (Flock Bronzewing, Flock Pigeon)*			
218.	24677	*Pitta moluccensis (Blue-winged Pitta)*			
219.	24842	*Platalea regia (Royal Spoonbill)*			
220.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
221.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
222.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
223.	25703	*Podargus strigoides (Tawny Frogmouth)*			
224.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
225.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
226.	25706	*Pomatostomus temporalis (Grey-crowned Babbler)*			
227.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
228.		*Ptilonorhynchus guttatus*			
229.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
230.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
231.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
232.	48096	*Rhipidura albiscapa (Grey Fantail)*			
233.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
234.	24457	*Rhipidura phasiana (Mangrove Grey Fantail)*			
235.	30948	*Smicrornis brevirostris (Weebill)*			
236.	24521	*Sterna bengalensis (Lesser Crested Tern)*			
237.	25640	*Sterna dougallii (Roseate Tern)*		IA	
238.	25642	*Sterna hirundo (Common Tern)*		IA	
239.	25643	*Sterna hybrida (Whiskered Tern)*			
240.	48593	*Sternula albifrons (Little Tern)*		IA	
241.	48594	*Sternula nereis (Fairy Tern)*			
242.	24329	*Stictonetta naevosa (Freckled Duck)*			
243.	24482	*Stiltia isabella (Australian Pratincole)*			

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244.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
245.	25754	*Sula leucogaster (Brown Booby)*		IA	
246.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
247.	30870	*Taeniopygia guttata (Zebra Finch)*			
248.		*Thalasseus bengalensis*			
249.	48597	*Thalasseus bergii (Crested Tern)*		IA	
250.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
251.	25548	*Todiramphus chloris (Collared Kingfisher)*			
252.	24306	*Todiramphus chloris subsp. pilbara (Pilbara Collared Kingfisher)*			
253.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
254.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
255.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
256.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
257.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
258.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
259.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
260.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
261.	24851	*Turnix velox (Little Button-quail)*			
262.		*Tyto delicatula*			
263.	25577	*Vanellus miles (Masked Lapwing)*			
264.	24386	*Vanellus tricolor (Banded Lapwing)*			
265.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
266.	24857	*Zosterops luteus (Yellow White-eye)*			

Bryopsid (Moss)

267.	32348	*Eccremidium arcuatum*			

Dicotyledon

268.	4886	*Abutilon amplum*			
269.	4891	*Abutilon fraseri (Lantern Bush)*			
270.	18120	*Abutilon fraseri subsp. fraseri*			
271.	4895	*Abutilon lepidum*			
272.	4899	*Abutilon malvifolium (Bastard Marshmallow)*			
273.	4902	*Abutilon oxycarpum (Flannel Weed)*			
274.	43020	*Abutilon oxycarpum subsp. Prostrate (A.A. Mitchell PRP 1266)*			
275.	3209	*Acacia ampliceps*			
276.	44580	*Acacia ampliceps x bivenosa*			
277.	44586	*Acacia ampliceps x sclerosperma subsp. sclerosperma*			
278.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
279.	3223	*Acacia arida*			
280.	3241	*Acacia bivenosa*			
281.	44588	*Acacia bivenosa x sclerosperma subsp. sclerosperma*			
282.	13403	*Acacia colei*			
283.	17013	*Acacia colei var. colei*			
284.	3270	*Acacia coriacea (Wirewood)*			
285.	13500	*Acacia coriacea subsp. coriacea*			
286.	13502	*Acacia coriacea subsp. pendens*			
287.	16174	*Acacia elachantha*			
288.	12673	*Acacia glaucocaesia*			
289.	3356	*Acacia gregorii (Gregory's Wattle)*			
290.	3377	*Acacia inaequilatera (Baderi)*			
291.	3434	*Acacia maitlandii (Maitland's Wattle)*			
292.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
293.	3506	*Acacia pyrifolia (Ranji Bush, Kandji)*			
294.	29016	*Acacia pyrifolia var. morrisonii*			
295.	29015	*Acacia pyrifolia var. pyrifolia*			
296.	13078	*Acacia sclerosperma subsp. sclerosperma*			
297.	29135	*Acacia sericophylla*			
298.	3551	*Acacia sphaerostachya*			
299.	19456	*Acacia stellaticeps*			
300.	13070	*Acacia synchronicia*			
301.	3573	*Acacia tenuissima*			
302.	3579	*Acacia trachycarpa (Minni Ritchi, Balgali)*			
303.	3606	*Acacia xiphophylla*			
304.	2645	*Achyranthes aspera (Chaff Flower)*			
305.	4583	*Adriana tomentosa*			
306.	17422	*Adriana tomentosa var. tomentosa*			
307.	6486	*Aegialitis annulata (Club Mangrove)*			
308.	6478	*Aegiceras corniculatum (River Mangrove)*			
309.	2646	*Aerva javanica (Kapok Bush)*	Y		
310.	3680	*Aeschynomene indica (Budda Pea)*			

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311.	3609	*Albizia lebbeck*			
312.	4739	*Alectryon oleifolius*			
313.	11487	*Alectryon oleifolius subsp. oleifolius*			
314.	2651	*Alternanthera nana (Hairy Joyweed)*			
315.	2652	*Alternanthera nodiflora (Common Joyweed)*			
316.	17147	*Alysicarpus muelleri*			
317.	20018	*Amaranthus undulatus*			
318.	5277	*Ammannia baccifera*			
319.	5278	*Ammannia multiflora*			
320.	7832	*Angianthus milnei (Cone-spike Angianthus)*			
321.	6580	*Asclepias curassavica (Redhead Cottonbush)*	Y		
322.	2450	*Atriplex amnicola (Swamp Saltbush)*			
323.	2451	*Atriplex bunburyana (Silver Saltbush)*			
324.	2453	*Atriplex codonocarpa (Flat-topped Saltbush)*			
325.	2463	*Atriplex isatidea (Coast Saltbush)*			
326.	2466	*Atriplex lindleyi*			
327.	2476	*Atriplex semilunaris (Annual Saltbush)*			
328.	6828	*Avicennia marina (White Mangrove)*			
329.	14555	*Avicennia marina subsp. marina*			
330.	5186	*Bergia trimera*			
331.	7854	*Bidens bipinnata (Bipinnate Beggartick)*	Y		
332.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
333.	2772	*Boerhavia gardneri*			
334.	2773	*Boerhavia paludosa*			
335.	2774	*Boerhavia repleta*			
336.	2775	*Boerhavia schomburgkiana*			
337.		*Boerhavia sp.*			
338.	11167	*Bonamia erecta*			
339.	6608	*Bonamia pannosa*			
340.	44782	*Bonamia pilbarensis*			
341.	12716	*Brachychiton acuminatus*			
342.	2995	*Brassica x napus*	Y		
343.	4603	*Bridelia tomentosa*			
344.	5291	*Bruguiera exaristata (Ribbed Mangrove)*			
345.	11055	*Cajanus cinereus*			
346.	10972	*Cajanus marmoratus*			
347.	11150	*Cajanus pubescens*			
348.	7905	*Calotis multicaulis (Many-stemmed Burr-daisy)*			
349.	3749	*Canavalia rosea (Wild Jack Bean)*			
350.	2981	*Capparis spinosa*			
351.	48291	*Capparis spinosa subsp. nummularia*			
352.	6567	*Carissa lanceolata (Conkerberry, Marnuwiji)*			
353.	2949	*Cassytha capillaris*			
354.	2950	*Cassytha filiformis (Love Vine, Jirawan)*			
355.	6539	*Centaurium erythraea (Common Centaury)*	Y		
356.	19762	*Centipeda minima subsp. macrocephala*			
357.	39680	*Ceriops australis*			
358.	33516	*Chrysocephalum gilesii*			
359.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
360.	6732	*Clerodendrum tomentosum*			
361.	13689	*Clerodendrum tomentosum var. lanceolatum*			
362.	3769	*Clitoria ternatea*	Y		
363.	2778	*Codonocarpus cotinifolius (Native Poplar, Kundurangu)*			
364.	2776	*Commicarpus australis (Perennial Tar Vine)*			
365.	19880	*Convolvulus angustissimus*			
366.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
367.	4857	*Corchorus elachocarpus*			
368.	17339	*Corchorus incanus*			
369.	25847	*Corchorus incanus subsp. incanus*			
370.	13659	*Corchorus laniflorus*			
371.	4862	*Corchorus parviflorus*			
372.	4865	*Corchorus tridens*			
373.	13467	*Corchorus trilocularis*			
374.	4867	*Corchorus walcottii (Woolly Corchorus)*			
375.	17093	*Corymbia hamersleyana*			
376.	17092	*Corymbia opaca*			
377.	19565	*Cressa australis*			
378.	3774	*Crotalaria cunninghamii (Green Birdflower, Bilbun)*			
379.	19378	*Crotalaria dissitiflora subsp. benthamiana*			
380.	20179	*Crotalaria medicaginea var. neglecta*			

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381.	3785	*Crotalaria novae-hollandiae (New Holland Rattlepod)*			
382.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
383.	4809	*Cryptandra pungens*			
384.	41720	*Cucumis argenteus*			
385.	41721	*Cucumis variabilis*			
386.	17118	*Cullen leucanthum*			
387.	17119	*Cullen leucochaites*			
388.	17120	*Cullen pogonocarpum*			
389.	13733	*Cuscuta victoriana*			
390.	6584	*Cynanchum floribundum (Dumara Bush, Tjipa)*			
391.	48280	*Cynanchum viminale subsp. australe*			
392.	6963	*Datura metel (Downy Thornapple)*	Y		
393.	7317	*Dentella asperata*			
394.	7318	*Dentella minutissima*			
395.	3852	*Desmodium campylocaulon*			
396.	3853	*Desmodium filiforme*			
397.	3856	*Desmodium muelleri*			
398.	3612	*Dichrostachys spicata (Pied Piper Bush)*			
399.	7166	*Dicliptera armata*			
400.	4745	*Diplopeltis eriocarpa (Hairy Pepperflower)*			
401.	4759	*Dodonaea coriacea*			
402.	48390	*Dolichandrone occidentalis*			
403.	2504	*Dysphania plantaginella*			
404.	2506	*Dysphania rhadinostachya*			
405.	11890	*Dysphania rhadinostachya subsp. rhadinostachya*			
406.	6682	*Ehretia saligna (False Cedar)*			
407.	14301	*Ehretia saligna var. saligna*			
408.	2511	*Enchylaena tomentosa (Barrier Saltbush)*			
409.	12064	*Enchylaena tomentosa var. tomentosa (Barrier Saltbush)*			
410.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
411.	16363	*Eremophila maculata subsp. brevifolia (Native Fuchsia)*			
412.	3871	*Erythrina vespertilio (Yulbah)*			
413.	35345	*Eucalyptus camaldulensis subsp. obtusa (Blunt-budded River Red Gum)*			
414.	5752	*Eucalyptus prominens*			
415.	14548	*Eucalyptus victrix*			
416.	4617	*Euphorbia australis (Namana)*			
417.	35307	*Euphorbia australis var. australis*			
418.	35303	*Euphorbia australis var. subtomentosa*			
419.	4619	*Euphorbia biconvexa*			
420.	4620	*Euphorbia boophthona (Gascoyne Spurge)*			
421.	9048	*Euphorbia careyi*			
422.	4623	*Euphorbia coghlanii (Namana)*			
423.	4626	*Euphorbia drummondii (Caustic Weed, Piwi)*			
424.	4629	*Euphorbia hirta (Asthma Plant)*	Y		
425.	4635	*Euphorbia myrtoides*			
426.	4647	*Euphorbia tannensis*			
427.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
428.	42879	*Euphorbia trigonosperma*			
429.	13281	*Euphorbia vaccaria*			
430.	42876	*Euphorbia vaccaria var. vaccaria*			
431.	6617	*Evolvulus alsinoides (Tropical Speedwell)*			
432.	11200	*Evolvulus alsinoides var. villosicalyx*			
433.	25811	*Ficus aculeata*			
434.	31578	*Ficus aculeata var. indecora (Ranji)*			
435.	19648	*Ficus brachypoda*			
436.	1753	*Ficus platypoda (Native Fig, Makartu)*			
437.	1759	*Ficus virens (Albayi)*			
438.	12096	*Ficus virens var. virens*			
439.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
440.	4654	*Flueggea virosa*			
441.	12013	*Flueggea virosa subsp. melanthesoides (Dogwood, Guwal)*			
442.	5188	*Frankenia ambita*			
443.	5209	*Frankenia pauciflora (Seaheath)*			
444.	3938	*Glycine canescens (Silky Glycine)*			
445.	2674	*Gomphrena affinis*			
446.	2680	*Gomphrena cunninghamii*			
447.	2682	*Gomphrena flaccida (Gomphrena Weed)*			
448.	11131	*Gomphrena sordida*			
449.	31074	*Gomphrena sp. Martins Well (K.F. Kenneally 6116)*			Y
450.	7509	*Goodenia forrestii*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
451.	7521	*Goodenia lamprosperma*			
452.	7526	*Goodenia microptera*			
453.	12552	*Goodenia muelleriana*			
454.	10982	*Goodenia stobbsiana*			
455.	7556	*Goodenia tenuiloba*			
456.	4910	*Gossypium australe (Native Cotton)*			
457.	4913	*Gossypium hirsutum (Upland Cotton)*	Y		
458.	2079	*Grevillea pyramidalis (Caustic Bush, Tjungu)*			
459.	19570	*Grevillea pyramidalis subsp. leucadendron*			
460.	15975	*Grevillea pyramidalis subsp. pyramidalis*			
461.	13440	*Grevillea wickhamii subsp. aprica*			
462.	12832	*Gymnanthera cunninghamii*		P3	
463.	2177	*Hakea lorea (Witinti)*			
464.	19137	*Hakea lorea subsp. lorea*			
465.	17301	*Heliotropium chrysocarpum*			
466.	6704	*Heliotropium conocarpum*			
467.	6706	*Heliotropium cunninghamii*			
468.	6707	*Heliotropium curassavicum (Smooth Heliotrope)*			
469.	6712	*Heliotropium heteranthum*			
470.	17307	*Heliotropium inexplicitum*			
471.	6718	*Heliotropium tenuifolium (Mamukata)*			
472.	29316	*Hibiscus austrinus*			
473.	29317	*Hibiscus austrinus var. austrinus*			
474.	4923	*Hibiscus brachysiphonius*			
475.	4925	*Hibiscus coatesii*			
476.	4933	*Hibiscus leptocladus*			
477.	4942	*Hibiscus sturtii (Sturt's Hibiscus)*			
478.	5215	*Hybanthus aurantiacus*			
479.	3973	*Indigofera colutea (Sticky Indigo)*			
480.	3980	*Indigofera linifolia*			
481.	3981	*Indigofera linnaei (Birdsville Indigo)*			
482.	3982	*Indigofera monophylla*			
483.	3987	*Indigofera trita*			
484.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
485.	6631	*Ipomoea lonchophylla (Cowvine)*			
486.	6633	*Ipomoea muelleri (Poison Morning Glory, Yumbu)*			
487.	6635	*Ipomoea pes-caprae*			
488.	11312	*Ipomoea pes-caprae subsp. brasiliensis*			
489.	6636	*Ipomoea plebeia (Bellvine)*			
490.	6637	*Ipomoea polymorpha*			
491.	8088	*Ixiochlamys cuneifolia*			
492.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
493.	8095	*Lactuca saligna (Wild Lettuce, Willow-leaf Lettuce)*	Y		
494.	4960	*Lawrencia viridigrisea*			
495.		*Lawsonia inermis*			
496.	3029	*Lepidium linifolium*			
497.	3035	*Lepidium pedicellosum*			
498.	3038	*Lepidium pholidogynum*			
499.	3613	*Leucaena leucocephala (Leucaena)*	Y		
500.	4060	*Lotus australis (Austral Trefoil)*			
501.	4061	*Lotus cruentus (Redflower Lotus)*			
502.	2544	*Maireana georgei (Satiny Bluebush)*			
503.	2556	*Maireana planifolia (Low Bluebush)*			
504.	11662	*Maireana tomentosa subsp. tomentosa*			
505.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
506.	5933	*Melaleuca linophylla*			
507.	5051	*Melhania oblongifolia*			
508.	7082	*Mimulus gracilis*			
509.	8109	*Minuria integerrima (Smooth Minuria)*			
510.	8110	*Minuria leptophylla (Minnie Daisy)*			
511.	6490	*Muellerolimon salicorniaceum*			
512.	17158	*Myoporum montanum (Native Myrtle)*			
513.	2573	*Neobassia astrocarpa*			
514.	3614	*Neptunia dimorphantha (Sensitive Plant)*			
515.	6971	*Nicotiana benthamiana (Tjuntiwari)*			
516.	6976	*Nicotiana occidentalis (Native Tobacco)*			
517.	11331	*Nicotiana occidentalis subsp. obliqua*			
518.	11856	*Nicotiana occidentalis subsp. occidentalis*			
519.	11734	*Nicotiana rosulata subsp. rosulata*			
520.	38421	*Notoleptopus decaisnei*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
521.	7338	*Oldenlandia crouchiana*			
522.	19640	*Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)*		P3	
523.	6651	*Operculina aequisepala*			
524.	5227	*Opuntia stricta (Common Prickly Pear)*	Y		
525.	5226	*Passiflora foetida (Stinking Passion Flower)*	Y		
526.	13494	*Pentalepis trichodesmoides*			
527.	18462	*Peplidium sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768)*			
528.	3675	*Petalostylis labicheoides (Slender Petalostylis)*			
529.	9056	*Phyllanthus baccatus*			
530.	17626	*Phyllanthus erwinii*			
531.	4680	*Phyllanthus maderaspatensis*			
532.	17794	*Phyllanthus tenellus*	Y		
533.	20652	*Physalis angulata*	Y		
534.	5230	*Pimelea ammocharis*			
535.	41300	*Pittosporum phillyreoides (Weeping Pittosporum, Yaliti)*			
536.	8167	*Pluchea dentex*			
537.	17816	*Pluchea ferdinandi-muelleri*			
538.	43944	*Pluchea longiseta*			
539.	8168	*Pluchea rubelliflora*			
540.	8170	*Pluchea tetranthera*			
541.	2901	*Polycarpaea holtzei*			
542.	2903	*Polycarpaea longiflora*			
543.	41365	*Polygala glaucifolia*			
544.	6653	*Polymeria ambigua (Morning Glory)*			
545.	6655	*Polymeria calycina*			
546.	17513	*Polymeria lanata*			
547.		*Polymeria sp.*			
548.	2878	*Portulaca conspicua*			
549.	43981	*Portulaca decipiens*			
550.	2884	*Portulaca oleracea (Purslane, Wakati)*			
551.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
552.	8192	*Pterocaulon sphacelatum (Apple Bush, Fruit Salad Plant)*			
553.	8193	*Pterocaulon sphaeranthoides*			
554.	2690	*Ptilotus aervoides*			
555.	2696	*Ptilotus astrolasius*			
556.	2698	*Ptilotus auriculifolius*			
557.	2699	*Ptilotus axillaris (Mat Mulla Mulla)*			
558.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
559.	2706	*Ptilotus carinatus*			
560.	2711	*Ptilotus clementii (Tassel Top)*			
561.	2717	*Ptilotus divaricatus (Climbing Mulla Mulla)*			
562.	2725	*Ptilotus fusiformis*			
563.	2728	*Ptilotus gomphrenoides*			
564.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
565.	2741	*Ptilotus macrocephalus (Featherheads)*			
566.	2745	*Ptilotus murrayi*			
567.	2746	*Ptilotus nobilis (Tall Mulla Mulla)*			
568.	41001	*Ptilotus nobilis subsp. nobilis (Yellow Tails)*			
569.	2747	*Ptilotus obovatus (Cotton Bush)*			
570.	2749	*Ptilotus petiolatus*			
571.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
572.	2766	*Ptilotus villosiflorus*			
573.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
574.	2584	*Rhagodia preissii*			
575.	11240	*Rhagodia preissii subsp. obovata*			
576.	5295	*Rhizophora stylosa (Spotted-leaved Red Mangrove)*			
577.	13246	*Rhodanthe humboldtiana*			
578.	13310	*Rhodanthe margarethae*			
579.	4190	*Rhynchosia australis (Rhynchosia)*			
580.	20862	*Rhynchosia bungarensis*		P4	
581.	4191	*Rhynchosia minima (Rhynchosia)*			
582.	2443	*Rumex vesicarius (Ruby Dock)*	Y		
583.	30434	*Salsola australis*			
584.	2357	*Santalum lanceolatum (Northern Sandalwood, Yarnguli)*			
585.	12578	*Scaevola acacioides*			
586.	7606	*Scaevola crassifolia (Thick-leaved Fan-flower)*			
587.	7608	*Scaevola cunninghamii*			
588.	7614	*Scaevola globulifera*			
589.	7644	*Scaevola spinescens (Currant Bush, Maroon)*			
590.	41660	*Schenkia australis*			

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591.	41646	*Schenkia clementii*			
592.	2604	*Sclerolaena costata*			
593.	8877	*Sclerolaena gardneri*			
594.	2616	*Sclerolaena glabra*			
595.	2633	*Sclerolaena uniflora (Two-spined Saltbush)*			
596.	12279	*Senna artemisioides subsp. helmsii*			
597.	12280	*Senna artemisioides subsp. oligophylla*			
598.	12303	*Senna costata*			
599.	18443	*Senna ferraria*			
600.	18346	*Senna glutinosa*			
601.	12305	*Senna glutinosa subsp. chatelainiana*			
602.	12307	*Senna glutinosa subsp. glutinosa*			
603.	12309	*Senna glutinosa subsp. pruinosa*			
604.	12308	*Senna glutinosa subsp. x luerssenii*			
605.	18451	*Senna hamersleyensis*			
606.	12312	*Senna notabilis*			
607.	12319	*Senna venusta*			
608.	4196	*Sesbania cannabina (Sesbania Pea)*			
609.	2818	*Sesuvium portulacastrum*			
610.	4971	*Sida cardiophylla*			
611.	4976	*Sida echinocarpa*			
612.	4977	*Sida fibulifera (Silver Sida)*			
613.	4988	*Sida rohlenae*			
614.	33698	*Sida sp. Pilbara (A.A. Mitchell PRP 1543)*			
615.	4989	*Sida spinosa (Spiny Sida)*			
616.	6998	*Solanum cleistogamum*			
617.	7002	*Solanum diversiflorum*			
618.	7007	*Solanum esuriale (Quena)*			
619.	7009	*Solanum gabrielae*			
620.	7014	*Solanum horridum*			
621.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
622.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
623.	7029	*Solanum phlomoides*			
624.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
625.	4729	*Stackhousia clementii*		P3	
626.	19555	*Stackhousia muricata subsp. annual (W.R. Barker 2172)*			
627.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
628.	7099	*Stemodia kingii*			
629.	8234	*Streptoglossa adscendens*			
630.	8235	*Streptoglossa bubakii*			
631.	8237	*Streptoglossa decurrens*			
632.	8238	*Streptoglossa liatroides*			
633.	8240	*Streptoglossa odora*			
634.	8241	*Streptoglossa tenuiflora*			
635.	7729	*Stylidium fluminense*			
636.	3182	*Stylobasium spathulatum (Pebble Bush)*			
637.	12353	*Stylosanthes hamata (Verano Stylo)*	Y		
638.	2638	*Suaeda arbusculoides*			
639.	43203	*Surreya diandra*			
640.	12356	*Swainsona formosa*			
641.	4231	*Swainsona kingii*			
642.	4233	*Swainsona leeana*			
643.	4234	*Swainsona maccullochiana (Ashburton Pea)*			
644.	4242	*Swainsona pterostylis*			
645.	7363	*Synaptantha tillaeacea*			
646.	31616	*Tecticornia auriculata*			
647.	33236	*Tecticornia halocnemoides (Shrubby Samphire)*			
648.	33240	*Tecticornia halocnemoides subsp. longispicata*			
649.	33238	*Tecticornia halocnemoides subsp. tenuis*			
650.	33317	*Tecticornia indica*			
651.	33319	*Tecticornia indica subsp. bidens*			
652.	33356	*Tecticornia indica subsp. indica*			
653.	33357	*Tecticornia indica subsp. julacea*			
654.	33318	*Tecticornia indica subsp. leiostachya (Samphire)*			
655.	33299	*Tecticornia pergranulata subsp. elongata*			
656.	31618	*Tecticornia pruinosa*			
657.	33220	*Tecticornia pterygosperma subsp. denticulata*			
658.		*Tephrosia Fortescue (A.A. Mitchell 606)*			
659.	4263	*Tephrosia clementii*			
660.	4272	*Tephrosia leptoclada*			

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661.	4280	*Tephrosia rosea (Flinders River Poison, Bungoo'dah)*			
662.	19531	*Tephrosia rosea var. clementii*			
663.	15947	*Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)*			
664.	17768	*Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)*			
665.	15949	*Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)*			
666.	41811	*Tephrosia sp. Fortescue (A.A. Mitchell 606)*			
667.	42442	*Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)*			
668.	40060	*Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)*			
669.	4285	*Tephrosia supina*			
670.	45698	*Terminalia circumalata*			
671.	5310	*Terminalia platyphylla (Wild Plum, Durin)*			
672.	5313	*Terminalia supranitifolia*		P3	
673.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
674.	2942	*Tinospora smilacina (Snakevine, Oondala)*			
675.	6278	*Trachymene oleracea*			
676.	19043	*Trachymene oleracea subsp. oleracea*			
677.	2830	*Trianthema portulacastrum (Giant Pigweed)*	Y		
678.	44362	*Trianthema triquetrum*			
679.	44360	*Trianthema turgidifolium*			
680.	4377	*Tribulus hirsutus*			
681.	4379	*Tribulus macrocarpus*			
682.	4380	*Tribulus occidentalis (Perennial Caltrop)*			
683.	4381	*Tribulus platypterus (Cork Hopbush)*			
684.	4383	*Tribulus terrestris (Caltrop)*	Y		
685.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			
686.	11750	*Trichodesma zeylanicum var. zeylanicum*			
687.	7381	*Trichosanthes cucumerina*			
688.	8252	*Tridax procumbens (Tridax, Tridax Daisy)*	Y		
689.	48201	*Trigastrotheca molluginea*			
690.	4873	*Triumfetta appendiculata*			
691.	14694	*Triumfetta clementii*			
692.	14942	*Triumfetta maconochieana*			
693.	30716	*Vachellia farnesiana (Mimosa Bush)*	Y		
694.	4323	*Vigna lanceolata (Maloga Vigna, Wega)*			
695.	11576	*Vigna lanceolata var. lanceolata*			
696.	31391	*Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)*			
697.	46577	*Vigna triodiophila*		P3	
698.	5106	*Waltheria indica*			
699.	6578	*Wrightia saligna*			
700.	29095	*Zaleya galericulata subsp. galericulata*			
701.	4326	*Zornia albiflora*			
702.	12679	*Zornia muelleriana subsp. congesta*			
703.	4395	*Zygophyllum retivalve*			

Fish

704.		*? ?*			
705.		*Acentrogobius sp.*			
706.		*Alepes apercna*			
707.		*Alepes mate*			Y
708.		*Ambassis vachellii*			
709.		*Amblyeleotris gymnocephala*			
710.		*Amblygobius bynoensis*			
711.		*Amniataba caudavittata*			
712.		*Apogon brevicaudatus*			
713.		*Apogon cavitiensis*			
714.		*Arius leptaspis*			Y
715.		*Bathygobius fuscus*			
716.		*Bathygobius laddi*			
717.		*Callionymus japonicus*			Y
718.		*Callionymus sp.*			
719.		*Carangoides sp.*			
720.		*Caranx bucculentus*			
721.		*Carcharhinus brachyurus*			
722.		*Cephalopholis boenak*			
723.		*Chelmon marginalis*			
724.		*Chelmon muelleri*			
725.		*Chirocentrus dorab*			
726.		*Coris sp.*			
727.		*Ctenotrypauchen microcephalus*			
728.		*Cynoglossus maculipinnis*			
729.		*Cynoglossus sp.*			

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730.		*Drombus sp.*			
731.		*Eleutheronema tetradactylum*			
732.		*Elops hawaiensis*			
733.		*Enneapterygius sp.*			
734.		*Epinephelus coioides*			
735.		*Epinephelus malabaricus*			
736.		*Eviota queenslandica*			
737.		*Favonigobius melanobranchus*			
738.		*Gerres subfasciatus*			
739.		*Gnatholepis argus*			
740.		*Gobiodon rivulatus*			
741.		*Halichoeres nigrescens*			
742.		*Halieutaea brevicaudata?*			
743.		*Inegocia japonica*			
744.		*Leiognathus sp.*			
745.		*Lepidotrigla sp.*			
746.		*Liza subviridis*			
747.		*Liza vaigiensis*			
748.		*Lophiocharon trisignatus*			
749.		*Lutjanus argentimaculatus*			
750.		*Lutjanus malabaricus*			
751.		*Lutjanus russellii*			
752.		*Metavelifer multiradiatus*			
753.		*Micrognathus micronotopterus*			
754.		*Monacanthus chinensis*			
755.		*Monodactylus argenteus*			
756.		*Mugil cephalus*			
757.		*Nemipterus celebicus*			
758.		*Netuma proxima*			
759.		*Omobranchus punctatus*			
760.		*Omobranchus rotundiceps*			
761.		*Onigocia pedimacula*			
762.		*Opistognathus darwiniensis*			
763.		*Oxyurichthys sp.*			
764.		*Paramonacanthus choirocephalus*			
765.		*Pegasus volitans*			
766.		*Pentapodus porosus*			
767.		*Pentapodus sp.*			
768.		*Platycephalus sp.*			
769.		*Pleurosicya sp.*			
770.		*Polydactylus multiradiatus*			
771.		*Pomadasys maculatus*			
772.		*Priacanthus hamrur*			
773.		*Pristotis obtusirostris*			
774.		*Protonibea diacanthus*			
775.		*Rastrelliger kanagurta*			
776.		*Scatophagus argus*			
777.		*Scolecenchelys macroptera*			
778.		*Scolopsis taenioptera*			
779.		*Secutor insidiator*			
780.		*Sillago burrus*			
781.		*Sillago lutea*			
782.		*Sorsogona tuberculata*			
783.		*Sphyraena barracuda*			
784.		*Synanceia horrida*			
785.		*Terapon jarbua*			
786.		*Triacanthus sp.*			
787.		*Tylosurus crocodilus*			
788.		*Valamugil seheli*			
789.		*Valenciennea muralis*			
790.		*Yirrkala sp.*			
791.		*Yongeichthys nebulosus*			

Fungus

792.		*Phellinus rimosus*			
793.	46616	*Triodiomyces altilis*			

Hepatic (Liverwort)

794.		*Riccia albida*			

Invertebrate

795.		*Actacarus pacificus*			

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796.		*Agauopsis arborea*			Y
797.		*Agauopsis dasyderma*			Y
798.		*Agauopsis moorea*			Y
799.		*Agauopsis obtusa*			Y
800.		*Agraptocorixa parvipunctata*			
801.		*Allodessus bistrigatus*			
802.		*Alluaudomyia sp.*			
803.		*Alona cf. verrucosa*			
804.		*Alona rigidicaudis*			
805.		*Amblyomma triguttatum*			
806.		*Aname mainae*			
807.		*Aname mellosa*			
808.		*Anax papuensis*			
809.		*Anisops canaliculatus*			
810.		*Anisops hackeri*			
811.		*Anisops nasutus*			
812.		*Anisops sp.*			
813.		*Anomalohalacarus dampierensis*			Y
814.		*Anopheles annulipes s.l.*			
815.		*Arthrorhabdus paucispinus*			
816.		*Austrostrophus stictopygus*			
817.		*Bdelloidea sp. 2:2*			
818.		*Berosus pulchellus*			
819.		*Carenum pulchrum*			
820.		*Carenum subplanatum*			
821.		*Carenum venustum*			
822.		*Catadromus lacordairei*			
823.		*Ceriodaphnia cornuta*			
824.		*Ceriodaphnia n. sp. a (Berner sp.#3) (SAP)*			
825.		*Ceriodaphnia n. sp. c (Berner sp.#1) (SAP)*			
826.		*Cheumatopsyche wellsae*			
827.		*Chironomus aff. alternans (V24) (CB)*			
828.		*Chlaenius australis*			
829.		*Cloeon sp.*			
830.		*Copidognathus lutarius*			Y
831.		*Copidognathus meridianus*			
832.		*Copidognathus piger*			Y
833.		*Cryptochironomus griseidorsum*			
834.		*Cryptoerithus halli*			
835.		*Cryptoerithus occultus*			
836.		*Culex crinicauda*			
837.		*Culex palpalis*			
838.		*Cybister tripunctatus*			
839.		*Cypretta sp PSW074*			
840.		*Cypricercus sp. 422 (CB)*			
841.		*Dasyheleinae sp. P2 (PSW)*			
842.		*Dicrotendipes P5 (=balciunasi?) (PSW)*			
843.		*Difflugia sp. P1*			
844.		*Dineutus australis*			
845.		*Diplacodes bipunctata*			
846.		*Diplacodes haematodes*			
847.		*Ecnomus pilbarensis*			
848.		*Encentridophorus sarasini*			
849.		*Enchytraeidae sp.*			
850.		*Enochrus deserticola*			
851.		*Ephemeroporus barroisi s.l.*			
852.		*Ephydridae sp. 12 (PSW)*			
853.		*Eretes australis*			
854.		*Ethmostigmus curtipes*			
855.		*Euchlanis lyra*			
856.		*Euglypha sp.*			
857.		*Geoscaptus laevissimus*			
858.		*Glyptophysa sp*			
859.		*Halacaridae sp.*			
860.		*Hellyethira sp.*			
861.		*Hemicordulia sp.*			
862.		*Heterocypris tatei*			
863.		*Hogna crispipes*			
864.		*Hydraena sp.*			
865.		*Hydrochus obscuroaeneus*			

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866.		*Hydroglyphus grammopterus (=trilineatus)*			
867.		*Hydroglyphus leai*			
868.		*Hydroglyphus orthogrammus*			
869.		*Hyphydrus elegans*			
870.		*Hyphydrus lyratus*			
871.		*Ilyocypris australiensis*			
872.		*Ilyodromus sp BOS25*			
873.		*Indolpium sp.*			
874.		*Ischnura aurora aurora*			
875.		*Isidorella egraria*			
876.		*Isobactrus australiensis*			Y
877.		*Isobactrus obesus*			Y
878.		*Isopedella gibsandi*			
879.		*Isopedella tindalei*			
880.		*Keratella procurva*			
881.		*Laccophilus sharpi*			
882.		*Lampona ampeinna*			
883.		*Lampona cylindrata*			
884.		*Lamponina scutata*			
885.		*Larsia albiceps*			
886.		*Latonopsis australis*			
887.		*Latrodectus geometricus*			
888.		*Leberis cf. diaphanus*			
889.		*Lecane bulla*			
890.		*Lecane luna*			
891.		*Lecane punctata*			
892.		*Lecane thalera*			
893.		*Lecane ungulata*			
894.		*Lepadella patella*			
895.		*Limbodessus compactus*			
896.		*Limnadopsis "pilbarensis" (ex P2)(PSW)*			Y
897.		*Limnocythere dorsosicula*			
898.		*Litarachna bartschae*			Y
899.		*Lychas sp. 2*			
900.		*Macrochaetus sp.*			
901.		*Megacephala greyana*			
902.		*Mesocyclops brooksi*			
903.		*Mesovelia hungerfordi*			
904.		*Metacyclops sp. P2 (PSW)*			
905.		*Micronecta n. sp. P3 (PSW)*			
906.		*Microvelia (Austromicrovelia) peramoena*			
907.		*Monommata sp.*			
908.		*Muscidae sp. P1*			
909.		*Naididae (ex Tubificidae)*			
910.		*Nematoda sp. P2/P4 (PSW)*			
911.		*Nephila edulis*			
912.		*Omoedus orbiculatus*			
913.		*Opisthopora sp.*			
914.		*Orthetrum caledonicum*			
915.		*Orthomorpha coarctata*			
916.		*Ostracoda (unident.)*			
917.		*Oxyopes variabilis*			
918.		*Pantala flavescens*			
919.		*Paracymus pygmaeus*			
920.		*Paracymus spenceri*			
921.		*Paratanytarsus sp. P2 (PSW)*			
922.		*Pediana horni*			
923.		*Pediana tenuis*			
924.		*Phreodrilid with dissimilar ventral chaetae*			
925.		*Phreodrilid with similar ventral chaetae*			
926.		*Pilbarascutigera incola*			
927.		*Pilbarophreatoicus platyarthricus*			
928.		*Polypedilum nubifer*			
929.		*Pontarachne australis*			Y
930.		*Procladius paludicola*			
931.		*Quistrachia legendrei*			
932.		*Regimbartia attenuata*			
933.		*Rhagada angulata*			
934.		*Rhagada convicta*			
935.		*Rhagada dampierana*			

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936.		*Rhagada minima*			
937.		*Rhagada perprima*			
938.		*Rheotanytarsus trivittatus*			
939.		*Rhombognathus dispar*			Y
940.		*Rhombognathus ocularis*			Y
941.		*Rhombognathus scutulatus*			
942.		*Scaptognathides hawaiiensis*			Y
943.		*Scaptognathides ornatus*			Y
944.		*Scirtidae sp.*			
945.		*Scolopendra laeta*			
946.		*Scolopendra morsitans*			
947.		*Simaetha tenuior*			
948.		*Simognathus platyaspis*			Y
949.		*Simognathus salebrosus*			Y
950.		*Simognathus tener*			Y
951.		*Simulium ornatipes*			
952.		*Sternolophus australis*			
953.		*Stratiomyidae sp.*			
954.		*Supunna picta*			
955.		*Tabanidae sp.*			
956.		*Tanytarsus sp. D (SAP)*			
957.		*Tasmanocoenis arcuata*			
958.		*Testudinella patina*			
959.		*Tramea stenoloba*			
960.		*Trichocyclus nigropunctatus*			
961.		*Urodacus armatus*			
962.		*Venatrix arenaris*			
963.		*Wesmaldra nixaut*			
964.		*Wydundra kennedy*			
965.		*Wydundra nixaut*			Y
966.		*Zenodorus orbiculatus*			
967.		*Zonocypretta kalimna*			
Lichen					
968.	27576	*Acarospora nodulosa*			
969.	44918	*Caloplaca michelagoensis*			
970.		*Caloplaca sp.*			
971.	27715	*Diploschistes actinostomus*			
972.	27932	*Peltula bolanderi*			
973.	28194	*Xanthoria parietina*			
Mammal					
974.		*Canis familiaris*			
975.	30883	*Canis lupus subsp. familiaris (Dog)*	Y		
976.	24253	*Capra hircus (Goat)*	Y		
977.	24181	*Chaerephon jobensis (Greater Northern Freetail-bat, Northern Mastiff Bat)*			
978.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
979.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
980.	24084	*Dugong dugon (Dugong)*		S	
981.	24041	*Felis catus (Cat)*	Y		
982.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
983.	24217	*Leggadina lakedownensis (Northern Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga)*		P4	
984.	24180	*Macroderma gigas (Ghost Bat)*		T	
985.	25489	*Macropus robustus (Euro, Biggada)*			
986.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
987.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
988.	24051	*Megaptera novaeangliae (Humpback Whale)*		S	
989.		*Mormopterus (Ozimops) cobourgianus*			
990.	24183	*Mormopterus loriae (Little Northern Freetail-bat)*			
991.	24223	*Mus musculus (House Mouse)*	Y		
992.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
993.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
994.	24192	*Nyctophilus arnhemensis (Arnhem Land Long-eared Bat)*			
995.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
996.		*Nyctophilus geoffroyi subsp. pallescens*			
997.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
998.	48034	*Osphranter robustus (Euro, Biggada)*			
999.	34016	*Ovis aries (Sheep)*			
1000.	24144	*Petrogale rothschildi (Rothschild's Rock-wallaby)*			
1001.		*Planigale sp. nov.*			

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1002.	24105	*Pseudantechinus roryi (Rory's Pseudantechinus)*			
1003.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
1004.	24233	*Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)*		P4	
1005.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
1006.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
1007.	24172	*Pteropus alecto (Black Flying-fox)*			
1008.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			
1009.	24245	*Rattus rattus (Black Rat)*	Y		
1010.	24246	*Rattus tunneyi (Pale Field-rat)*			
1011.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
1012.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
1013.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
1014.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
1015.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
1016.	24040	*Vulpes vulpes (Red Fox)*	Y		
1017.	24248	*Zyzomys argurus (Common Rock-rat)*			
Monocotyledon					
1018.	207	*Aristida contorta (Bunched Kerosene Grass)*			
1019.	215	*Aristida latifolia (Feathertop Wiregrass)*			
1020.	226	*Arundo donax (Giant Reed)*	Y		
1021.	229	*Astrebla pectinata (Barley Mitchell Grass)*			
1022.	750	*Bulbostylis barbata*			
1023.	752	*Bulbostylis turbinata*			
1024.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		
1025.	259	*Cenchrus echinatus (Burrgrass)*	Y		
1026.	41568	*Cenchrus setaceus (Fountain Grass)*	Y		
1027.	29721	*Cenchrus setiger (Birdwood Grass)*	Y		
1028.	266	*Chloris barbata (Purpletop Chloris)*	Y		
1029.	273	*Chrysopogon fallax (Golden Beard Grass)*			
1030.	1165	*Commelina ensifolia (Wandering Jew, Buargu)*			
1031.	279	*Cymbopogon ambiguus (Scentgrass)*			
1032.	281	*Cymbopogon obtectus (Silkyheads)*			
1033.	46558	*Cynodon convergens*			
1034.	774	*Cyperus bifax (Downs Nutgrass)*			
1035.	12801	*Cyperus blakeanus*			
1036.	777	*Cyperus bulbosus (Bush Onion, Tjanmata)*			
1037.	12811	*Cyperus cunninghamii subsp. cunninghamii*			
1038.	798	*Cyperus iria*			
1039.	804	*Cyperus nervulosus*			
1040.	814	*Cyperus squarrosus*			
1041.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
1042.	290	*Dactyloctenium radulans (Button Grass)*			
1043.	303	*Dichanthium fecundum (Curly Bluegrass)*			
1044.	313	*Digitaria ctenantha (Comb Finger Grass)*			
1045.	328	*Echinochloa colona (Awnless Barnyard Grass)*	Y		
1046.	827	*Eleocharis geniculata*			
1047.	357	*Enneapogon caerulescens (Limestone Grass)*			
1048.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
1049.	363	*Enneapogon pallidus (Conetop Nineawn)*			
1050.	380	*Eragrostis eriopoda (Woollybutt Grass, Wangurnu)*			
1051.	16731	*Eragrostis exigua*			
1052.	381	*Eragrostis falcata (Sickle Lovegrass)*			
1053.	38505	*Eragrostis surreyana*		P3	
1054.	399	*Eragrostis xerophila (Knotty-butt Neverfail)*			
1055.	400	*Eriachne aristidea*			
1056.	403	*Eriachne benthamii (Swamp Wanderrie)*			
1057.	411	*Eriachne helmsii (Buck Wanderrie Grass)*			
1058.	413	*Eriachne mucronata (Mountain Wanderrie Grass)*			
1059.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
1060.	16485	*Eriachne pulchella subsp. dominii*			
1061.	421	*Eriachne tenuiculmis*			
1062.	11011	*Eulalia aurea*			
1063.	851	*Fimbristylis dichotoma (Eight Day Grass)*			
1064.	878	*Fimbristylis rara*			
1065.	131	*Halodule uninervis*			
1066.	162	*Halophila decipiens*			
1067.	163	*Halophila minor*			
1068.	164	*Halophila ovalis (Sea Wrack)*			
1069.	165	*Halophila spinulosa*			
1070.	458	*Iseilema dolichotrichum*			

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1071.	459	*Iseilema eremaeum*			
1072.	139	*Najas tenuifolia (Water Nymph)*			
1073.	503	*Panicum decompositum (Native Millet, Kaltu-kaltu)*			
1074.	504	*Panicum effusum (Hairy Panic Grass)*			
1075.	505	*Panicum laevinode*			
1076.	515	*Paraneurachne muelleri (Northern Mulga Grass)*			
1077.	518	*Paspalidium clementii (Clements Paspalidium)*			
1078.	523	*Paspalidium rarum (Rare Paspalidium)*			
1079.	525	*Paspalidium tabulatum*			
1080.	16257	*Schoenoplectus subulatus*			
1081.	1010	*Schoenus punctatus*		P3	
1082.	606	*Setaria dielsii (Diels' Pigeon Grass)*			
1083.	613	*Setaria verticillata (Whorled Pigeon Grass)*	Y		
1084.	619	*Sorghum plumosum (Plume Canegrass)*			
1085.	12919	*Sorghum plumosum var. plumosum*			
1086.	622	*Sorghum timorense*			
1087.	625	*Spinifex longifolius (Beach Spinifex)*			
1088.	629	*Sporobolus australasicus (Fairy Grass)*			
1089.	635	*Sporobolus virginicus (Marine Couch)*			
1090.	132	*Syringodium isoetifolium*			
1091.	169	*Thalassia hemprichii*			
1092.	17820	*Themeda sp. Hamersley Station (M.E. Trudgen 11431)*		P3	
1093.	17819	*Themeda sp. Mt Barricade (M.E. Trudgen 2471)*			
1094.	673	*Themeda triandra*			
1095.	679	*Triodia angusta*			
1096.	13131	*Triodia epactia*			
1097.	696	*Triodia pungens (Soft Spinifex)*			
1098.	704	*Triodia wiseana (Limestone Spinifex)*			
1099.	17910	*Washingtonia filifera*	Y		
1100.	725	*Whiteochloa airoides*			
1101.	728	*Whiteochloa cymbiformis*			
1102.	729	*Xerochloa barbata (Rice Grass)*			
1103.	731	*Xerochloa laniflora (Rice Grass)*			
1104.	732	*Yakirra australiensis*			
Pteridophyte (Fern)					
1105.	33	*Cheilanthes contigua*			
1106.	76	*Marsilea hirsuta (Nardoo)*			
Reptile					
1107.		*Acanthophis wellsei*			
1108.	25332	*Acanthophis wellsi (Pilbara Death Adder)*			
1109.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
1110.	25318	*Antaresia perthensis (Pygmy Python)*			
1111.	25448	*Antaresia stimsoni (Stimson's Python)*			
1112.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
1113.	25320	*Aspidites melanocephalus (Black-headed Python)*			
1114.	25236	*Aspidites ramsayi (Woma)*			
1115.	25331	*Brachyurophis approximans (North-western Shovel-nosed Snake)*			
1116.	25015	*Carlia munda (Shaded-litter Rainbow Skink)*			
1117.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
1118.	25336	*Chelonia mydas (Green Turtle)*		T	
1119.	24919	*Crenadactylus ocellatus subsp. horni (Clawless Gecko)*			
1120.	30893	*Cryptoblepharus buchananii*			
1121.	25020	*Cryptoblepharus plagiocephalus*			
1122.	30892	*Cryptoblepharus ustulatus*			
1123.	25458	*Ctenophorus caudicinctus (Ring-tailed Dragon)*			
1124.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
1125.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
1126.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
1127.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
1128.	24886	*Ctenophorus reticulatus (Western Netted Dragon)*			
1129.	25024	*Ctenotus angusticeps (Airlie Island Ctenotus, Northwestern coastal Ctenotus)*		P3	
1130.	25036	*Ctenotus duricola*			
1131.	25462	*Ctenotus grandis*			
1132.	25043	*Ctenotus grandis subsp. titan*			
1133.	25045	*Ctenotus helenae*			
1134.	25052	*Ctenotus leonhardii*			
1135.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
1136.	25060	*Ctenotus pantherinus subsp. acripes (Leopard Ctenotus)*			
1137.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			

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1138.	25070	*Ctenotus robustus*			
1139.	25072	*Ctenotus rubicundus*			
1140.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
1141.	25074	*Ctenotus schomburgkii*			
1142.	25077	*Ctenotus serventyi*			
1143.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
1144.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
1145.	25001	*Delma nasuta*			
1146.	25002	*Delma pax*			
1147.	25004	*Delma tincta*			
1148.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
1149.	25295	*Demansia psammophis subsp. cupreiceps (Yellow-faced Whipsnake)*			
1150.	25297	*Demansia rufescens (Rufous Whipsnake)*			
1151.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
1152.	41404	*Diplodactylus galaxias (Northern Pilbara Beak-faced Gecko)*			
1153.	24937	*Diplodactylus mitchelli*			
1154.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
1155.	25092	*Egernia depressa (Southern Pygmy Spiny-tailed Skink)*			
1156.	25101	*Egernia pilbarensis (Pilbara Skink)*			
1157.	25362	*Ephalophis greyae*			
1158.	42404	*Eremiascincus isolepis*			
1159.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
1160.	25342	*Eretmochelys imbricata subsp. bissa (Hawksbill Turtle)*		T	
1161.	25327	*Fordonia leucobalia (White-bellied Mangrove Snake)*			
1162.	25301	*Furina ornata (Moon Snake)*			
1163.	24956	*Gehyra pilbara*			
1164.	24958	*Gehyra punctata*			
1165.	24959	*Gehyra variegata*			
1166.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
1167.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
1168.	25363	*Hydrelaps darwiniensis*			
1169.	25125	*Lerista bipes*			
1170.	30928	*Lerista clara*			
1171.	30929	*Lerista jacksoni*			
1172.	25155	*Lerista muelleri*			
1173.	30925	*Lerista verhmens*			
1174.	25005	*Lialis burtonis*			
1175.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
1176.	25239	*Liasis olivaceus subsp. olivaceus (Olive Python)*			
1177.	30933	*Lucasium stenodactylum*			
1178.	25184	*Menetia greyii*			
1179.	25187	*Menetia surda subsp. surda*			
1180.	25495	*Morethia ruficauda*			
1181.	25193	*Morethia ruficauda subsp. exquisita*			
1182.	25344	*Natator depressus (Flatback Turtle)*		T	
1183.	25196	*Notoscincus butleri (lined soil-crevice skink (Dampier))*		P4	
1184.	25197	*Notoscincus ornatus subsp. ornatus*			
1185.	24976	*Oedura marmorata (Marbled Velvet Gecko)*			
1186.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
1187.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
1188.	25261	*Pseudechis australis (Mulga Snake)*			
1189.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
1190.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
1191.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
1192.	24924	*Strophurus ciliaris subsp. aberrans*			
1193.	24927	*Strophurus elderi*			
1194.	24932	*Strophurus jeanae*			
1195.	24949	*Strophurus wellingtonae*			
1196.	25269	*Suta fasciata (Rosen's Snake)*			
1197.	25307	*Suta punctata (Spotted Snake)*			
1198.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
1199.	30814	*Tympanocryptis cephalus (Pebble Dragon)*			
1200.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
1201.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
1202.	25212	*Varanus eremius (Pygmy Desert Monitor)*			
1203.	25216	*Varanus giganteus (Perentie)*			
1204.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
1205.	25223	*Varanus panoptes subsp. rubidus*			
1206.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
1207.	25526	*Varanus tristis (Racehorse Monitor)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1208.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government
Department of the Environment and Energy

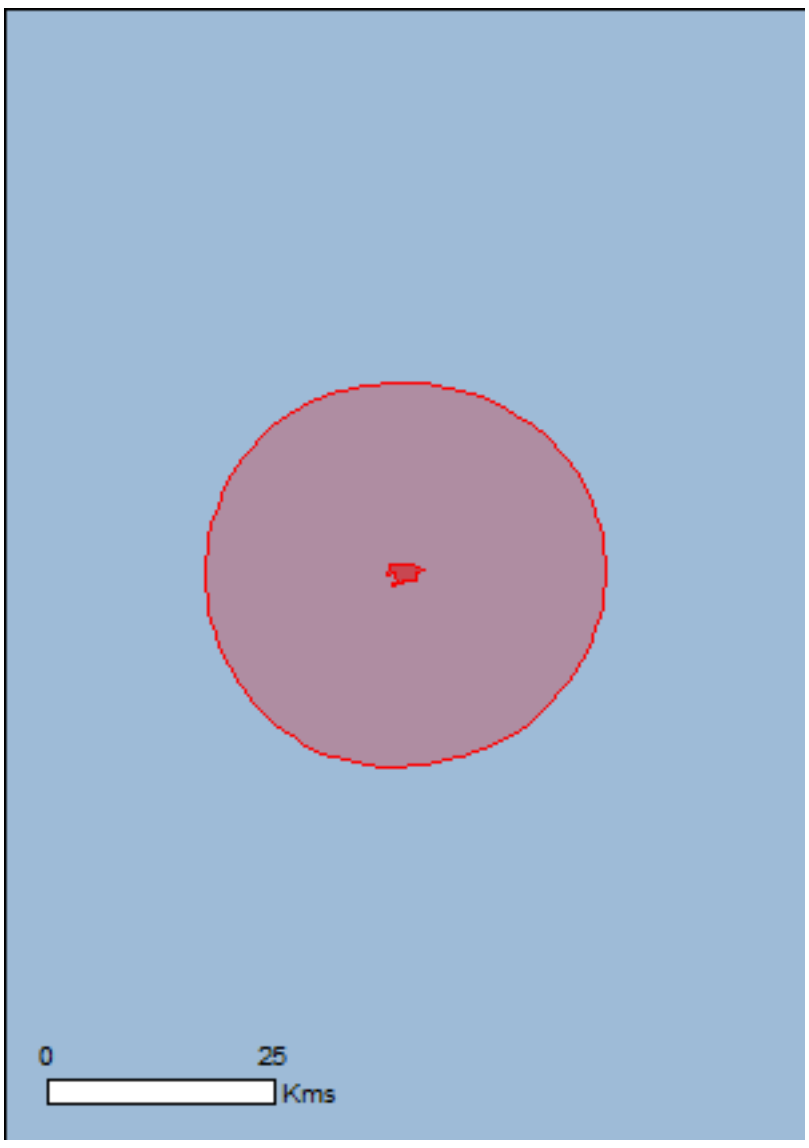
EPBC Act Protected Matters Report

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.

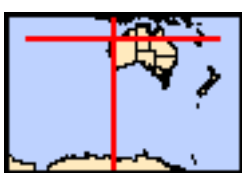
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 25/10/18 12:49:16



Coordinates

Buffer: 20.0Km



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:	31
Listed Migratory Species:	60

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:	101
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:	5
Regional Forest Agreements:	None
Invasive Species:	17
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 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
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

Name	Status	Type of Presence
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 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 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 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
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

Name	Status	Type of Presence
[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
[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 may occur within area
[Fregata ariel](#)		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to 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 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

Name	Threatened	Type of Presence
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
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	Species or species habitat may 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

Name	Threatened	Type of Presence
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 may 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
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

Name	Threatened	Type of Presence
		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 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

Name	Threatened	Type of Presence
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 may 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 may 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
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

Name	Threatened	Type of Presence
		habitat may occur within area
[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

Name	Threatened	Type of Presence
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely 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		
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 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

Name	Threatened	Type of Presence
		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
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

Name	Threatened	Type of Presence
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
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

Name	Threatened	Type of Presence
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 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

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Murujuga	WA
Unnamed WA36907	WA
Unnamed WA36909	WA
Unnamed WA36915	WA
Unnamed WA38287	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 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

Name	Status	Type of Presence
		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 known 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

-20.701745 116.820217,-20.702467 116.811935,-20.710576 116.81275,-20.71174 116.798202,-20.714069 116.798459,-20.714871 116.789361,-20.712463 116.789661,-20.712142 116.793309,-20.704033 116.792494,-20.704836 116.783353,-20.697329 116.786142,-20.696807 116.785971,-20.696245 116.810261,-20.701705 116.82026,-20.701705 116.82026,-20.701745 116.820217

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.

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Appendix D – Likelihood of Occurrence Assessment Fauna

Parameters of fauna likelihood of occurrence assessment

Assessment outcome	Description
Present	Species recorded during the field survey or from recent, reliable records from within or close proximity to the survey area.
Likely	Species are **likely** to occur in the survey area where there is suitable habitat within the survey area and there are recent records of occurrence of the species in close proximity to the survey area. OR Species known distribution overlaps with the survey area and there is suitable habitat within the survey area.
Unlikely	Species assessed as **unlikely** include those species previously recorded within 5 km of the survey area however: • There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the survey area. • The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area. OR Those species that have a known distribution overlapping with the survey area however: • There is limited habitat in the survey area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). • The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.
Highly unlikely	Species that are considered **highly unlikely** to occur in the survey area include: • Those species that have no suitable habitat within the survey area. • Those species that have become locally extinct, or are not known to have ever been present in the region of the survey area.

Definitions:
Survey area = clearing area area

Source information - desktop searches
PMST – DotE Protected Matters Search Tool (PMST) to identify fauna listed under the EPBC Act potentially occurring within the survey area (20 km buffer)
NM – DPaW NatureMap (accessed September 2018) (20 km buffer)

Fauna likelihood of occurrence assessment

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Birds								
Actitis hypoleucos (Common Sandpiper)	IA	Ma, Mi	X	X		The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (Geering et al. 2007; Higgins & Davies 1996). Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands (Higgins & Davies 1996).	This species has been within 20 km of the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Apus pacificus (Fork-tailed swift)	IA	Ma, Mi	X	X		In WA there are sparsely scattered records along the coast, ranging from the Eyre Bird Observatory and up the west coast. They are widespread in coastal and sub-coastal areas between Augusta and Carnarvon, including some on nearshore and offshore islands. The species is regularly seen in the Pilbara and Kimberley following cyclone and major storm activity.This species is almost exclusively aerial, flying less than 1 m to at least 300 m above ground. This species is considered rare in the south-west region (DSEWPaC 2013).	Habitat is present for this species aerially, however the species is not known to utilise terrestrial environments regularly.	Unlikely, however the species has been recorded in the vicinity of the survey area (Gaikhorst pers comm). Species is regarded as an opportunistic aerial visitor

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Arenaria interpres (Ruddy Turnstone)	IA	Ma, Mi	X	X		In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In north Australia it is known to occur in a wide variety of habitats, and may prefer wide mudflats. In southern Australia the Ruddy Turnstone prefers rockier coastlines and is less numerous on large embayments with extensive mudflats. On Flinders Island, Tasmania, it has been sighted around rocky reefs during spring and summer, and moves to bays and estuaries for autumn and winter. In south-west Australia, it may occur on pebble-strewn shores of saltlakes near the coast. On Rottnest Island, the Ruddy Turnstone prefers shores with scattered fragments of limestone. In New Zealand it has occasionally been recorded in paddocks or grassy areas. Surveys demonstrate that the Ruddy Turnstone can live away from coastal areas in habitats such river beds, and on inland lakes and adjacent farmland (Higgins & Davies 1996).	This species has been within 20 km of the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Calidris alba (Sanderling)	IA	Ma, Mi	X	X		In Australia, the species is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops. Less often the species occurs on more sheltered sandy shorelines of estuaries, inlets and harbours. Rarely, they are recorded in near-coastal wetlands, such as lagoons, hypersaline lakes, saltponds and samphire flats. They roost on/behind: bare sand high on the beach, clumps of washed-up kelp, coastal dunes, rocky reefs and ledges (Higgins & Davies 1996). Breeding occurs in the Arctic tundra of Greenland, Canada and Siberia.	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Calidris ferruginea (Curlew Sandpiper)	IA, Vu	Ma, Mi, CR	X	X		Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beachcast seagrass or seaweed. They rarely forage on exposed reefs (Higgins & Davies 1996).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Caladris canutus (Red Knot)	IA, Vu	Ma, Mi, EN	X	X		In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (Higgins & Davies 1996).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Calidris tenuirostris (Great Knot)	IA, Vu	Ma, Mi, CR	X	X		In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps (Higgins & Davies 1996). Typically, the Great Knot roosts in large groups in open areas, often at the waters edge or in shallow water close to feeding grounds (Higgins & Davies 1996; Rogers 2001). It is known that in hot conditions, waders prefer to roost where a damp substrate lowers the local temperature (Rogers 1999b). A group of approximately 8610 birds have been recorded roosting at an inland claypan near Roebuck Bay in north-west Western Australia (Collins et al. 2001).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Charadrius leschenaultii (Greater Sand Plover)	IA, Vu	Ma, Mi, VU	X	X		In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. They are occasionally recorded on near-coastal saltworks and saltlakes, including marginal saltmarsh, and on brackish swamps (Stweart et al. 2007).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Charadrius mongolus (Lesser Sand Plover)	IA, En	Ma, Mi, EN	X	X		In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. In north-western Australia, the species appears to use the Port Hedland saltworks in preference to nearby beaches. The species is seldom recorded away from the coast, at margins of lakes, soaks and swamps associated with artesian bores (Marchant & Higgins 1993).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Limosa lapponica (Bar-tailed Godwit)	IA, Vu	Ma, Mi, VU	X	X		The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas (Marchant & Higgins 1993).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Limosa limosa (Black-tailed Godwit)	IA	Ma, Mi	X	X		In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks (Higgins & Davies 1996).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Limicola falcinellus (Broad-billed Sandpiper)	IA	Ma, Mi	X	X		The Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby. Occasionally they occur on reefs or rocky platforms. They have also been recorded in creeks, swamps and lakes near the coast, particularly those with bare mudflats or sand exposed by receding water. They often favour mud among, or fringed by, mangroves, particularly on the seaward side and sometimes occur in estuaries edged by saltmarsh. They are rarely recorded inland. Foraging occurs on exposed flats of soft mud or wet sand at edges of coastal and near-coastal wetlands, often around channels on mudflats or in accumulated mud in swales between shell banks. In northern Australia, they forage in soft mud near mangroves, but may remain on same muddy section, even though fresher substrate may be exposed by the receding tide. They also forage in shallow water on muddy edges of ponds. They roost on the banks of sheltered sandy, shelly or shingly beaches (Higgins & Davies 1996).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Numenius madagascariensis (Eastern Curlew)	IA, Vu	Ma, Mi, CR	X	X		The Eastern Curlew is a large non-breeding migratory shorebird, found commonly along the north coast of Western Australia, but rarely south of Shark Bay. The species is found along the coastline from Barrow Island and Dampier Archipelago, through the Kimberley in WA to the NT. It is found in estuaries, bays, harbours, inlets and coastal lagoons, saltworks and sewerage farms, areas (e.g. intertidal mudflats or sandflats fringed by mangroves) often with beds of seagrass and occasionally on ocean beaches, coral reefs, rock platforms and rocky islets. The Eastern Curlew forages on soft, sheltered, intertidal sand- or mudflats, often near mangroves, on saltflats, marshes, coastal reefs and ocean beaches near the tideline. The species roosts in large flocks, separate from other waders on sandy spits and islets, dry beach sand near the high-water mark, among coastal vegetation and occasionally on reef-flats, in the shallow water of lagoons, near-coastal wetlands, in trees and posts (Morcombe 2004).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Numenius minutus (Little Curlew)	IA	Ma, Mi	X			When resting during the heat of day, the Little Curlew congregates around pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs. The species prefers pools with bare dry mud (including mudbanks in shallow water) and they do not use pools if they are totally dry, flooded or heavily vegetated (Higgins & Davies 1996). Birds may also rest in grassy, open woodlands and on bare blacksoil plains, or on dry or recently burnt grasslands on floodplains, which may be without vegetation for hundreds of metres, and occasionally on mudflats when nearby grasslands are unburnt, or around swamps. Resting has also been recorded under partly submerged vegetation. After freshwater pools dry up, roosting may occur in the shallows of reservoirs and the sea (Higgins & Davies 1996).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara..	Likely –opportunistic visitor/use in/to the survey area
Numenius phaeopus (Whimbrel)	IA	Ma, Mi,	X	X		The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields (Higgins & Davies 1996). There are a small number of inland records from saline lakes and canegrass swamps (Jarman 1978). It has also been recorded in coastal dunes and fields (Smith & Chafer 1987).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Pandion haliaetus (Osprey)	IA	Ma, Mi,	X	X		Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays.	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Pezoporus occidentalis (Night Parrot)	En	EN		X		The Night Parrot inhabits arid and semi-arid inland areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of *Triodia* grasslands in stony or sandy environments and of samphire and chenopod shrublands, including genera such as Atriplex, Bassia and Maireana, on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (Parker, 1980).	No habitat present and the species is not predicted to occur in the survey area	Highly Unlikely – Not known from the region.

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Gelochelidon nilotica (Gull-billed Tern)	IA	MA, Mi	X			The Gull-billed Tern is nomadic or migratory species in Australia. Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands, where resources are favourable (Morcombe 2004). They are only rarely found over the ocean. The Gull-billed Tern. Although essentially an inland species, outside breeding season it shows a distinct preference for saltmarshes and lagoons near the coast. Movements are not fully understood but it is common and widespread in Australia (Morcombe 2004).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Glareola maldivarum (Oriental Pratincole)	IA	MA, Mi	X	X		In non-breeding grounds in Australia, the Oriental Pratincole usually inhabits open plains, floodplains or short grassland (including farmland or airstrips), often with extensive bare areas. They often occur near terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins. The species also occurs along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons (Lloyd and Lloyd, 1991).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Red-necked Phalarope (*Phalaropus lobatus*)	IA	MA, Mi		X			This species has been recorded in the Pilbara region previously but very sporadically. The survey area has habitat present for the species.	Unlikely – Some habitat present, but species is a sporadic visitor and opportunistic at best.
Tringa brevipes (Grey-tailed Tattler)	IA	Ma, Mi,	X	X		The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. In Moreton Bay, Queensland, it is most abundant in areas with dense beds of seagrass. In Tasmania it is also abundant in areas with seagrass beds. It is less often on open flat sandy beaches or sandbanks, especially around accumulated seaweed or isolated clumps of dead coral. It is occasionally found around near-coastal wetlands, such as lagoons and lakes and ponds in sewage farms and saltworks. Inland records for the species are rare with sightings on river banks and the edges of rock pools (Higgins & Davies 1996).	This species has been within 20 km of the survey area habitat is present for the species. This species is known to persist in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Tringa stagnatilis (Marsh Sandpiper)	IA	Ma, Mi	X	X		The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats (Higgins & Davies 1996), although surveys in Kakadu National Park recorded more birds around shallow freshwater lakes than in areas influenced by tide (Bamford 1988). At the Top End they often use ephemeral pools on inundated freshwater and tidal floodplains (Higgins & Davies 1996). Three of the five sites with highest recorded numbers are saltwater habitats (Hunter Estuary, NSW; Port Hedland Saltworks, Western Australia; Tullakool Evaporation Ponds, NSW) (Watkins 1993). In the south-east Gulf of Carpentaria they have been recorded round both saline and fresh waters (Garnett 1989). Elsewhere they said to avoid, or rarely occur in, tidal habitats, and rarely occur on beaches. In Western Australia they prefer freshwater to marine environments. In south-east Australia they prefer inland saline lakes and coastal saltworks. They are found infrequently around mangroves (Higgins & Davies 1996).	This species has been within 20 km of the survey area habitat is present for the species. This species is known to persist in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

Xenus cinereus (Terek Sandpiper)	IA	Ma, Mi	X	X		The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (Halosarcia spp.). Birds are seldom near the edge of water, however, birds may wade into the water (Marchant & Higgins 1993). Occasionally, on sandy beaches, among seaweed and other debris and in rocky areas, Terek Sandpipers will use the supralittoral or upper littoral zone, where a film of water covers the sand. However, on exposed rock platforms, the species forages in the lower littoral zone and not the supralittoral or upper littoral zones (Marchant & Higgins 1993). Less often seen on sandy or shingle beaches, or on rock or coral reefs or platforms, Terek Sandpipers are occasionally sighted around drying sewage ponds and saltpans if surrounded by mudflats. The species is also found around brackish coastal swamps, lagoons and dune-lakes; and also on gravel or rocky edges of estuarine pools and freshwater river-pools (Marchant & Higgins 1993). Very occasionally, birds use swampy, grassy or cultivated paddocks near the coast (Marchant & Higgins 1993). Preferring to roost in or among mangroves, birds may perch in branches or roots up to 2 m from the ground, or beneath them in the shade on hot days. Occasionally, they roost in dead trees or among tangled driftwood. In Westernport Bay, Victoria, the Terek Sandpiper prefers to roost on isolated banks of mangroves, surrounded by water. Elsewhere, they may roost with other waders on flat shores, on muddy spits, islets or banks, and sometimes on sandy and pebbly beaches (Marchant & Higgins 1993).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Falco hypoleucos (Grey Falcon)	Vu				X	The Grey Falcon inhabits lightly timbered country, especially stony plains and lightly timbered acacia scrub. This species is considered scarce to rare and is found singularly or in pairs (Morcombe, 2004).	The survey area provides little habitat for this species.	Unlikely – opportunistic visitor for foraging in the survey area

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	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Falco peregrinus (Peregrine Falcon)	OS		X			The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, from coastal heath to alpine. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2004).	The survey area provides little habitat for this species.	Unlikely – opportunistic visitor for foraging in the survey area
Sharp-tailed Sandpiper *(Calidris acuminata)*	IA	Ma, Mi	X	X		In WA, scattered records occur along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division. Inland records indicate the species is widespread and scattered from Newman, east to Lake Cohen, south to Boulder and west to Meekatharra (Higgins & Davies 1996). The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation including lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They tend to occupy coastal mudflats mainly after ephemeral. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996).	This species has been within 20 km of the survey area habitat is present for the species. This species is known to persist in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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Australian Painted-snipe (*Rostratula australis*)	En	En		X		The Australian Painted Snipe is rarely seen as it is extremely secretive, keeping to dense vegetation of inland swamps, emerging only in subdued light of dawn and dusk. The preferred habitat of this species includes surrounds and shallows of wetlands that are well vegetated with dense cover (Morcombe 2004).	Some habitat present however the species has not been recorded in the immediate area.	Unlikely – Some habitat present, not known from the area.
Grey Plover (*Pluvialis squatarola*)	IA	Ma, Mi	X			In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes.	Some habitat present however the species has not been recorded in the immediate area.	Unlikely – Some habitat present, not known from the area.
Pluvialis fulva (Pacific Golden Plover)	IA	Ma, Mi	X			In Australia this species usually inhabits coastal habitats, on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in saltworks. It is sometimes recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, but can be seen in habitats with short grass in paddocks, crops or airstrips, or ploughed or recently burnt areas. In WA, the species is seldom recorded along the southern or south-western coasts (DEE 2017). They can be seen down to the Vasse Inlet, on the south coast to Oyster Harbour, the Kalgan River, and occasionally in inland lakes not far from the coast (Nevill 2013).	This species has been within 20 km of the survey area habitat is present for the species. This species is known to persist in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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Oriental Plover (Charadrius veredus)	IA	Ma, Mi	X	X		Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland. Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps or open areas that have been recently burnt (Storr, 1980).	This species has been within 20 km of the survey area habitat is present for the species. This species is known to persist in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Grey Wagtail (*Motacilla cinerea*)	IA	Ma, Mi		X		A migratory species that regularly visits northern Australia particularly the area from Broome to Darwin (Morcombe 2004). The species prefers coastal habitat near to water where it prefers to forage. However the species has been recorded further inland feeding on plains (Morcombe 2004).	No habitat present and the species has not been recorded in the immediate area.	Unlikely – No habitat present, not known from the area.
Common Greenshank (*Tringa nebularia*)	IA	Ma, Mi	X	X		The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetland and has the widest distribution of any shorebird in Australia (DSEWPaC 2013).	This species has been recorded within 20 km of the survey area and habitat is present for the species. This species is known to persist in the Pilbara. Numerous records occur at Karratha and Cape Lambert.	Likely –opportunistic visitor/use in/to the survey area

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Common Redshank (Tringa totanus)	IA	Ma, Mi		X		The Common Redshank is found at sheltered coastal wetlands such as bays, river estuaries, lagoons, inlets and saltmarsh (with bare open flats and banks of mud or sand). They are also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms (Higgins & Davies 1996). The Common Redshank has been observed feeding in shallow water, on wet bare mud or sand, or on algal deposits, round the edges of wetlands, near rocks or samphire (Higgins & Davies 1996). They have been recorded roosting on small elevated areas such as estuarine sandbars and muddy islets surrounded by water (Higgins & Davies 1996).	Some habitat present however the species has not been recorded in the immediate area.	Unlikely – Some habitat present, not known from the area.
Wood Sandpiper (*Tringa glareola*)	IA	Ma, Mi	X			The Wood Sandpiper is a seasonal visitor to Australia and has its largest numbers recorded in north-west Australia (Roebuck Bay near to Broome). Off the Tringa group (like the Common Greenshank) the Wood Sandpiper utilises a broad range of habitat types throughout Western Australia. Typical habitat includes well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. This species does not breed in Australia (DSEWPaC 2013).	This species has been recorded within 20 km of the survey area and habitat is present for the species. This species is known to persist in the Pilbara. Numerous records occur at Karratha and Cape Lambert.	Likely –opportunistic visitor/use in/to the survey area

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	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Pectoral Sandpiper (Calidris melanotos)	IA	Ma, Mi		X		In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies 1996).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Hirundo rustica (Barn Swallow)	IA	Ma, Mi		X		In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland.	No habitat present and the species has not been recorded in the immediate area.	Unlikely – No habitat present, not known from the area.
Sterna caspia (Caspian Tern)	IA	MA, Mi	X	X		The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs (Higgins & Davis 1996). Large numbers may shelter along the coast, behind coastal sand-dunes or coastal lakes during rough weather, and have been recorded inland after storms (Higgins & Davies 1996).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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						Foraging habitat: The Caspian Tern usually forages in open wetlands, including lakes and rivers. They often prefer sheltered shallow water near the margins, but can also be found in open coastal waters. In coastal inlets they may prefer to forage in tidal channels, or over submerged mudbanks (Higgins & Davis 1996).		
Onychoprion anaethetus (Bridled Tern)	IA	MA, Mi	X	X		Bridled Terns occupy tropical and subtropical seas, breeding on islands, including vegetated coral cays, rocky continental islands and rock stacks. They are only rarely found in inshore continental waters and along mainland coastlines, though the species is reported to breed on the mainland of far southern WA. In WA, breeding is widespread from islands off Cape Leeuwin (extending round the southern coast to Seal Rocks) north to Shark Bay and in Pilbara region and Kimberley Division. At sea, distribution extends from Cape Leeuwin north to Dirk Hartog Island, with isolated mainland coastal records at Point Maud and Ningaloo, and from Barrow Island to the Dampier Archipelago, and at sea off the Kimberley coast from waters west of the Dampier Peninsula to Ashmore Reef and Joseph Bonaparte Gulf (DotE 2016).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Sternula nereis subsp. nereis (Australian Fairy Tern)	VU	VU		X		The habitat of the fairy tern is essentially marine, including sheltered coasts, bays, inlets, estuaries, coastal lagoons, ocean beaches but rarely out to sea or out of sight of land. They also inhabit wetlands near the coast including salt ponds and lakes. This species favours sites with sand spits and small sand islets in river mouth channels (Morcombe 2004).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
*Chlidonias leucopterus (*White-winged Black Tern*)*	IA	Ma, Mi	X			In Australia, the White-Winged Tern mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. They frequent tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats. Terrestrial wetlands, including swamps, lakes, billabongs, rivers, floodplains, reservoirs, saltworks, sewage ponds and outfalls are also inhabited. Wetlands may be open, or with floating emergent or marginal vegetation. They rarely occur on inland wetlands. Most breeding is on vegetated, freshwater inland wetlands. The species is widespread on the southern west coast, north to Mongers Lake, and also on coasts of the Pilbara region and Kimberley Division, with occasional records farther inland, mainly along major river systems, such as the Ord. The species only rarely occurs in the Gascoyne Region of the central-western coast, and is occasionally recorded along the southern coast (DotE 2016).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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Sterna dougallii (Roseate Tern)	IA	Ma, Mi	X	X		The Roseate Tern occurs in coastal and marine areas in subtropical and tropical seas. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands. Birds rarely occur in inshore waters or near the mainland, usually venturing into these areas only accidentally, when nesting islands are nearby. In WA, the subspecies is regularly recorded north from Mandurah to around Eighty Mile Beach. Around the Kimberley coastline, the subspecies occurs at scattered sites, north to the Bonaparte Archipelago and possibly further. The subspecies used to be a sporadic visitor to the southwest, but occurs regularly at present. In addition, breeding colonies have been established on Lancelin Island and Second Rock (DotE 2016).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Sterna hirundo (Common Tern)	IA	Ma, Mi	X			Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores. Occasionally they are recorded in coastal and near-coastal wetlands, either saline or freshwater, including lagoons, rivers, lakes, swamps and saltworks. Sometimes they occur in mangroves or saltmarsh and, in bad weather, in coastal sand-dunes or coastal embayments. In WA, the species is rarely recorded south of approximately 30° S, with only scattered records north to the Kimberley Division (DotE 2016).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Sternula albifrons (Little Tern)	IA	Ma, Mi	X			In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches. One of its breeding populations is found across northern Australia, from about Broome to the Gulf of Carpentaria and eastern Cape York Peninsula. Non-breeding birds extend farther around the Australian coast than known breeding colonies. In WA the species regularly occurs south to approximately 20° S, with occasional records south of there (e.g. Shark Bay) (DotE 2016).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Calidris ruficollis (Red-necked Stint)	IA	Ma, Mi	X	X		The Red-necked Stint can be found in fresh and saline water, but primarily in coastal regions (Nevill 2013). It is mostly found in areas including sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation. It has been observed at the Nullarbor Plain, Reid, Stoke's Inlet, Grassmere Lake, Warden Lake, Dalyup and Yellilup Swamp, Swan River, Benger Swamp, Guraga Lake, Wittecarra, Harding River, coastal Gascoyne, the Pilbara and the Kimberley (DotE 2016).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area

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Calidris subminuta (Long-toed Stint)	IA	Ma, Mi	X	X		In Australia, the Long-toed Stint occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has been observed at open, less vegetated shores of larger lakes and ponds and is common on muddy fringes of drying ephemeral lakes and swamps, and frequents permanent wetlands such as reservoirs and artificial lakes. On the south-west coast the species is known from the Vasse River estuary, Guraga Lake and the Namming Nature Reserve. The species has occasionally been recorded in the Gascoyne Region, around Lake Wooleen, Meeberrie Station and McNeill Claypan. Inland records include Lake Brown, Hannan Lake, Lake Biolet, Newman Sewage Farm and Lake Gregory (DotE 2016).	This species has been recorded in the region and the survey area habitat is present for the species. This species is known to utilise environments in the Pilbara.	Likely –opportunistic visitor/use in/to the survey area
Motacilla cinerea (Yellow Wagtail)	IA	Ma, Mi		X		A migratory species that regularly visits northern Australia particularly the area from Broome to Darwin (Morcombe 2004). The species prefers coastal habitat near to water where it prefers to forage. However the species has been recorded further inland feeding on plains (Morcombe 2004).	No habitat present and the species has not been recorded in the immediate area.	Unlikely – No habitat present, not known from the area.
Reptiles								

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	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Ctenotus angusticeps (Airlie Island Skink)	P3	Vu	X	X		This species was formerly known from only two widely separated localities in Western Australia: Airlie Island, off the north-west coast and Roebuck Bay, just south of Broome. In 2012 this species was recorded in Port Hedland in samphire adjacent to mangroves. More recent surveys to determine the extent of this species' distribution outside of Port Hedland recorded species 70 km west and 50 km east of Port Hedland and an additional 10 locations between Karratha and Broome (BHPB pers. comm.) therefore showing the distribution of this species is more widespread than previously thought.	The survey area provides habitat for the species as it is associated with samphire and mudflats typically fringing mangroves and where crab holes are present. The species has been recorded west of the Karratha airport, likely within the survey area (Maryan pers comm.)	Likely– potential resident within survey area
Notoscincus butleri (Lined Soil-crevice Skink)	P4		X			Notoscincus butleri is a pale coppery-brown skink with bold black vertebral and dorsal stripes, broad black upper lateral stripes, white mid-lateral stripes and a narrow dark ventrolateral stripe. This species range is restricted to arid, rocky areas of near-coastal Pilbara region. Habitat is found in spinifex dominated areas near creek margins (Wilson and Swan 2010).	The survey area provides minimal habitat for the species	Unlikely – the survey area is likely to coastal for this species
Lerista nevinae (Nevin's Slider)	En	En			X	Lerista nevinae is known from coastal dunes vegetated with Acacia and low shrubs between Point Sampson and Cleaverville Beach and is considered to have a distribution of approximately 610 ha (Gaikhorst 2015). The species can also be found on Dixon Island. Despite numerous searches in the Karatha and Shamrock Bay area the species has not been found elsewhere (Gaikhorst 2015).	No habitat present and the species has not been recorded in the immediate area.	Unlikely – No habitat present, not known from the area.

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Liasis olivaceus subsp. barroni (Pilbara Olive Python)	VU	VU	X	X		The Olive Python (Pilbara subspecies) is a dull olive-brown to pale fawn or rich-brown python with a white underside and pale finely dotted lips. This species reaches an average size of 2.5 m but can grow up to 4 m long. The Olive Python's range is restricted to the Pilbara region, north Western Australia, and the Dampier Archipelago. Habitat consists of rocky escarpments, gorges and waterholes within the Pilbara region. The preferred microhabitats for this species are under rock piles, on top of rocks, and under spinifex as well as in man-made features such as overburden heaps, railway embankments and sewerage treatment ponds. The species' breeding season occurs from June to August, with males moving long distances in search of breeding females (Wilson and Swan 2010).	The survey area provides minimal habitat for the species. The species is known from the region in rocky environments	Unlikely – the survey area is likely to coastal for this species
Mammals								
Dasyurus hallucatus (Northern Quoll)	En	EN	X	X		The Northern Quoll once occurred across the majority of northern Australia but its range has significantly contracted. It occurs in the Pilbara region but in disjunct populations. The Northern Quoll inhabits a range of vegetation associations but is especially abundant on dissected rocky escarpment and eucalypt woodland within 200 km of the coast. It is known to den in rock crevices and rock piles and favours rocky areas. They are predominantly nocturnal but are occasionally active during the day, particularly during breeding and are known to have a large home range (Van Dyck and Strahan 2008).	The survey area provides minimal habitat for the species. The species is known from the region in rocky environments	Unlikely – the survey area is likely to coastal for this species

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Leggadina lakedownensis (Short-tailed Mouse, Karekanga)	P4		X			The Lakeland Downs Mouse occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, tropical Eucalyptus and Melaleuca woodlands and stony ranges. Most habitats, however, are seasonally inundated on red or white sandy-clay soils. They are nocturnal, largely solitary, and individuals spend the day in simple, single-chambered burrows (Van Dyck and Strahan 2008).	The survey area provides minimal habitat for the species	Unlikely – the survey area is likely to be to intertidal for this species
Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)	P4		X			The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the Western Pebble-mound Mouse can be found on stony hillsides with hummocky grasslands and little or no soil. It constructs large mounds of pebbles on stony slopes which cover an area of 0.5-9.0 square metres. 'Active' mounds are characterized by volcano-like cones capped by 'craters' that mark occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck and Strahan 2008).	The survey area provides minimal habitat for the species. The species is known from the region in rocky environments	Unlikely – the survey area is likely to coastal for this species
*Hydromys chrysogaster (*Water-rat*)*	P4		X			The Water Rat lives in the vicinity of permanent bodies of fresh or brackish water, from sub-alpine streams to lakes and farm dams, and on sheltered coastal beachs, mangroves and offshore islands. It can travel considerable distance overland and is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck and Strahan 2008).	The survey area provides minimal habitat for the species. The species is known from the region however requires rocky coastal environments to persist	Unlikely – the survey area lacks suitable habitat

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Macroderma gigas (Ghost Bat)	VU	VU	X	X		The Ghost Bat occurs in a wide range of habitats, and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia, and is sensitive to disturbance (Van Dyck and Strahan 2008).	The survey area provides minimal habitat for the species. The species is known from the region in rocky environments	Unlikely – the survey area maybe used opportunistically for foraging however no roosting habitat is present
Macrotis lagotis (Greater Bilby)	VU	VU		X		The Greater Bilby distribution in Western Australia is restricted to the north, including the Pilbara, Sandy and Gibson Deserts. The Greater Bilby usually spends the daytime in burrows, often built against termite mounds, spinifex hummock or shrubs (Van Dyck and Strahan 2008). Extant population of the Greater Bilby occur in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils. It occupies three major vegetation types; open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas. Laterite and rock feature substrates are an important part of Greater Bilby habitat. After dark they leave their burrows to feed and populations are known to move long distances when current habitat ranges become unsuitable. Bilbies are largely solitary, widely dispersed and found in low numbers. The current occurrence of the Greater Bilby is strongly associated with higher rainfall and temperatures, which promote areas of higher plant and food production. (Pavey 2006; Southgate et al. 2007).	The survey area provides minimal habitat for the species and it has not been recorded within 150 km of the survey area.	Unlikely – unlikely to occur

Common name (species name)	Status (BC Act/DPAW, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	CC Act	EPBC Act	NM	EPBC PMST	DPaW			
Rhinonicteris aurantia (Pilbara Leaf-nosed Bat)	VU	VU		X		The Pilbara Leaf-nosed Bat roosts in deep caves or mines in the wet season and forages nearby. This species occurs in the Pilbara region where its populations are scattered and localised. There are a few known populations of this species in the western Pilbara, roosting in caves formed in gorges that dissect massive siliceous sedimentary geology. It is most often observed in flight over waterholes in gorges (Van Dyck and Strahan 2008). Optimal roosts are thought to occur in caves that form between ascending rock layers, where humidity is maintained from seeping groundwater (Van Dyck and Strahan 2008). Roosts are commonly located over pools of water, or areas deep within the mine or cave structure which provides elevated temperature and humidity. Foraging habitat includes: Triodia hummock grasslands covering low rolling hills and shallow gullies, with *Eucalyptus camaldulensis* along the creeks; over small watercourses throughout granite boulder terrain; over pools and low shrubs in ironstone gorges; and in and around gravelly watercourses with *Melaleuca leucadendron*.	The survey area provides minimal habitat for the species. The species is known from the region in rocky environments	Unlikely – the survey area maybe used opportunistically for foraging however no roosting habitat is present

Definitions:

NM = Naturemap

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