Port of Port Hedland Zone 5 Bypass Channel Project

Image courtesy of Pilbara Ports and MScience.

6 April 2026

Dredging Environmental Monitoring and Management Plan

Document Information

REPORT NO.	MSA338.7R06
DATE	April 6, 2026
CLIENT	Pilbara Ports
DOCUMENT TITLE	Port of Port Hedland Zone 5 Bypass Channel Project. Dredging Environmental Monitoring and Management Plan
USAGE	This Dredging Environmental Monitoring and Management Plan (DEMMP) is provided for the use of Pilbara Ports to meet the requirements of the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and Western Australian Department of Water and Environmental Regulation (DWER) for the capital dredging and disposal of dredged material associated with the Zone 5 Bypass Channel Project at the Port of Port Hedland. The DEMMP has been developed in accordance with the requirements of the 2009 National Assessment Guidelines for Dredging, Environmental Protection Authority technical guidance for marine dredging proposals and DCCEEW requirements for sea dumping permits.
KEYWORDS	Dredging, environment, monitoring, management, Port Hedland
CITATION	MScience 2026. Port Of Port Hedland Zone 5 Bypass Channel Project. Dredging Environmental Monitoring and Management Plan. Unpublished report MSA338.7R06 to Pilbara Ports, Perth Western Australia, pp67

Version History

Version/Date	Issued as	Author	Reviewed	Approved
0/30.03.2026	Draft for internal review	IJP	JAS	IJP
1/31.03.2026	Draft for client review	IJP	LG/DP/RM/NB	IJP
2/06.04.2026	Final – client comments addressed	IJP	MJF	IJP

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Acronyms and Abbreviations

Abbreviation	Definition
AC	Almost Certain
AIS	Automated Identification System
AMSA	Australian Maritime Safety Authority
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
BC Act	*Biodiversity Conservation Act 2016*
BHD	Back-hoe Dredge
BIA	Biologically Important Area
BPPH	Benthic Primary Producer Habitats
CALM	*Conservation and Land Management Act 1984*
CAMBA	China Australia Migratory Bird Agreement
CD	Chart Datum
CEP	Channel Entry Project
CITIES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSD	Cutter Suction Dredge
DAF	Commonwealth Department of Agriculture and Fisheries
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEMMP	Dredging Environmental Monitoring and Management Plan
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSD	Department of State Development
DSJTSI	Department of Jobs, Tourism, Science and Innovation
DTMI	Department of Transport and Major Infrastructure
DWER	Department of Water and Environmental Regulation
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environmental Protection Authority
ERA	Environmental Risk Assessment
FID	Frequency Intensity Duration
FMG	Fortescue Metals Group
GPS	Geographical Positioning System
HSEQ	Health, Safety, Environment and Quality
IBA	Important Bird and Biodiversity Area
IMS	Invasive Marine Species
IUCN	International Union Conservation of Nature
JAMBA	Japan Australia Migratory Bird Agreement
KAC	Kariyarra Aboriginal Corporation
L	Likely
LAT	Lowest Astronomical Tide
MNES	Matters of National Environmental Significance
NAGD	National Assessment Guidelines for Dredging
PAH	Polycyclic Aromatic Hydrocarbons
PHPA	Poert Hedland Port Authority (now Pilbara Ports)
Pilbara Ports	Previously Pilbara Ports Authority

Abbreviation	Definition
PMST	Protected Matters Search Tool
PPA	Pilbara Ports Authority (now Pilbara Ports)
R	Rare
SAP	Sampling and Analysis Plan
SDP	Sea Dumping Permit
SST	Sea Surface Temperature
TACC	Technical Advisory and Consultative Committee
TOPH	Town of Port Hedland
TRH	Total Recoverable Hydrocarbons
TSHD	Trailing Suction Hopper Dredge
TSS	Total Suspended Sediments
U	Unlikely
UCL	Upper Confidence Limit
WAMSI	Western Australian Marine Science Institution

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1 INTRODUCTION

1.1 Project Background

The Port of Port Hedland (Port) is a single-channel port that underpins a significant proportion of Western Australia's export economy. The safe and continuous movement of vessels through the channel is fundamental to maintaining supply chain reliability for the State's iron ore industry and the broader national economy. While the channel has been progressively deepened and operational procedures strengthened over time, its underlying configuration remains challenging as all shipping activity depends on a single navigable route.

The channel can be broken down into six distinct zones based on location, bathymetry, channel slopes and sea conditions (Figure 1-1). As vessel sizes have increased and traffic volumes grown, the consequences of any disruption to this route have become more pronounced. Although vessel control failures remain relatively infrequent, incidents in recent years have demonstrated that even brief mechanical or navigational issues can escalate quickly within the confined geometry of the channel. In certain sections, such as Zone 5, the physical characteristics of the channel provide limited opportunity for recovery once control is lost.

Pilbara Ports is proposing to conduct capital dredging (the Project) to create a bypass channel to the east of (what is known as) Zone 5 of the existing channel. Once the capital works are completed, this area will become part of the annual channel maintenance dredging campaign (via amendment to the existing Port of Port Hedland five-year sea dumping permit for maintenance dredging SD2022/4041). The Project is a strategic marine risk-mitigation project intended to maintain vessel transit at an acceptable reduced capacity, should a grounding incident occur in Zone 5 of the channel.

The Project is proposed to address this specific vulnerability. It would establish a secondary navigable path adjacent to the existing alignment allowing vessel movements to continue should the main channel become obstructed. Unlike procedural or operational mitigations, which reduce likelihood, the bypass provides a physical redundancy that ensures continuity of trade during a major incident within this section of the channel. This Project is therefore a strategic resilience measure. It strengthens the Port's ability to manage the impacts of low-probability, high-consequence events and safeguards the economic value generated by uninterrupted export operations.

1.2 Document Purpose

Pilbara Ports is proposing to conduct capital dredging for the Project under a Sea Dumping Permit (SDP) issued under the *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act). This Dredging Environmental Monitoring and Management Plan (DEMMP) has been developed to manage the environmental performance of capital dredging that may be carried out over the life of the SDP.

In addition, this DEMMP will be used to support referral of the Project under Part IV of the *Environmental Protection Act 1986* (EP Act). Pilbara Ports believes the potential impacts of the Proposal on the environment can be mitigated under the Sea Dumping Act.

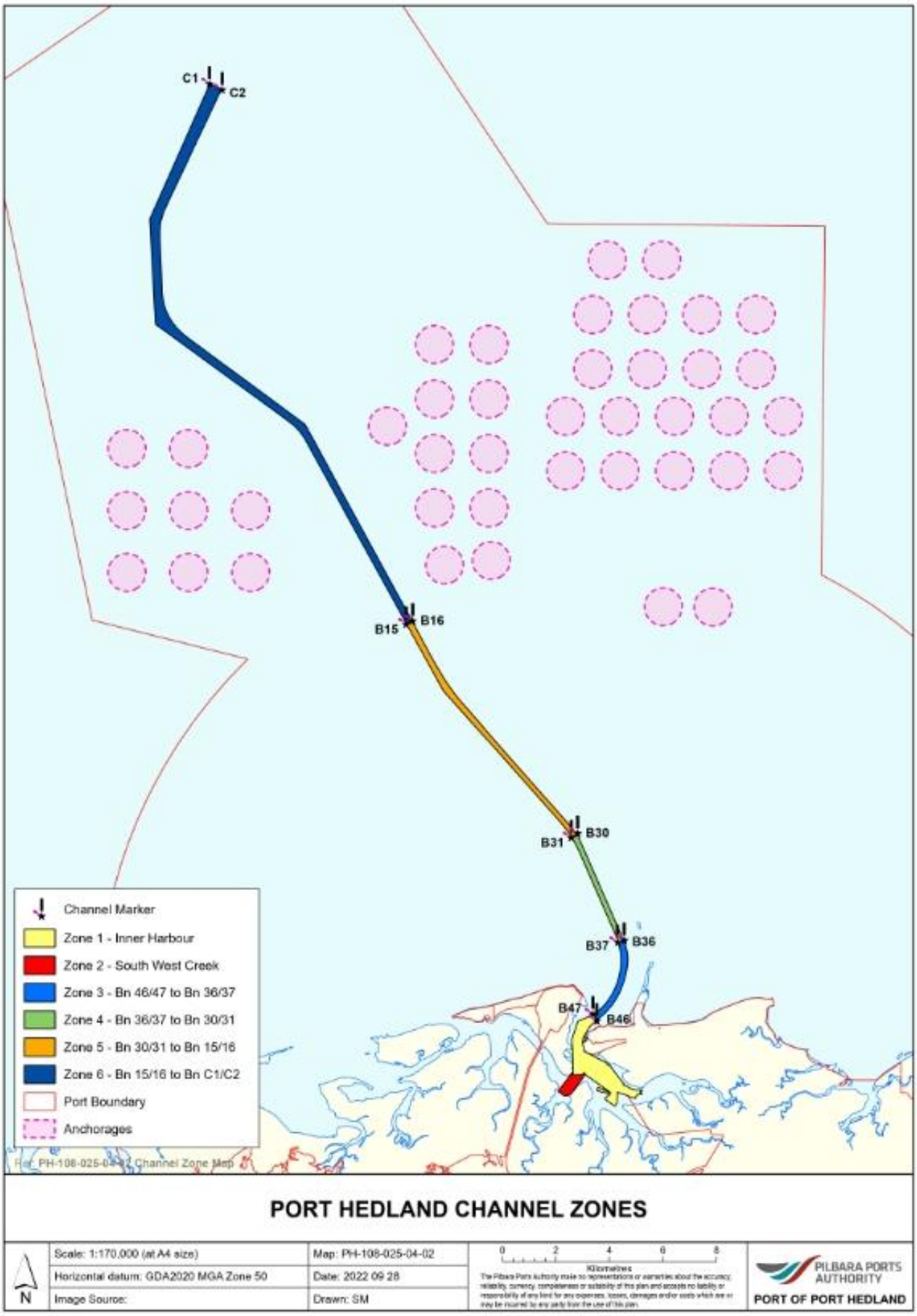

Figure 1-1. Port of Port Hedland existing channel zones

The DEMMP provides a framework for the development of specific monitoring and management programs to ensure environmental targets are met for the ocean disposal of dredging spoil by Pilbara Ports over the lifetime of the SDP. This plan is consistent with the Western Australian Environmental Protection Authority (EPA) 'Instruction and template: How to prepare Part IV Environmental Management Plans' for setting environmental protection outcomes and management targets.

In order to identify whether proposed dredge material is suitable for ocean disposal, physical and chemical analysis of the sediment to be dredged is required to demonstrate it is of low risk. Choice of the disposal site has been guided by physical, chemical and biological parameters, so that the potential impacts of sea disposal can be identified, minimised and monitored as appropriate. Safeguards for those actions are addressed within the SDP application and the sampling and analysis plan (SAP) which sets out how sediment chemistry will be assessed following the end of the currency period for existing data.

This DEMMP also provides the framework to guide the preparation of a detailed operational dredge management plan to be developed by the appointed dredge contractor(s) or be included within specific contract conditions accepted by the dredge contractor(s), prior to the commencement of the dredging activities.

1.3 Regulatory Framework

In Australian waters, ocean disposal of dredged material is regulated by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the Sea Dumping Act by applying the National Assessment Guidelines for Dredging (the NAGD) (Commonwealth of Australia 2009).

The NAGD (2009) contains provision for the granting of SDPs for dredging on the following basis:

- An assessment of the applicant's capacity to meet their obligations under the Sea Dumping Act and any permit granted;
- Establishment of a Technical Advisory and Consultative Committee (TACC) for long-term management; and
- Development and implementation of a satisfactory dredge management plan for the loading and disposal activities, and provide a SAP to support future applications.

In Western Australian State waters, marine dredging proposals are considered by the EPA services branch of the Department of Water and Environmental Regulation (DWER) under the EP Act. The EPA expects proponents to present their assessment of dredging impacts in accordance with the EPA 'Technical Guidance for the Environmental Impact Assessment of Marine Dredging Proposals (EPA 2021a), including development of a dredging environmental monitoring and management plan.

This DEMMP has been prepared to ensure compliance with the following legislation, including contingent regulations and advisories:

Commonwealth:

- *Environment Protection (Sea Dumping) Act 1981*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Biosecurity Act 2015*
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*

State (WA):

- *Environmental Protection Act 1986 (WA)*
- *Biodiversity Conservation Act 2016*
- *Port Authorities Act 1999*
- *Marine and Harbours Act 1981*
- *Western Australian Marine Act 1982*
- *Pollution of Waters by Oil and Noxious Substances Act 1987*
- *Fisheries Resources Management Act 1994 / Aquatic Resources Management Act 2016*

International Conventions:

- *International Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 73/78)*
- *International Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter 1972 (London Protocol)*
- *International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004*

Components of the DEMMP are based on guidance obtained from the following sources:

- National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009)
- Western Australian Environmental Protection Authority Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals (EPA 2021a);
- Western Australian Environmental Protection Authority Technical Guidance – Protecting the Quality of Western Australia's Marine Environment (EPA 2016a);
- Western Australian Environmental Protection Authority Technical Guidance – Protection of Benthic Communities and Habitats (EPA 2016b);
- Instructions: How to prepare Environmental Protection Act 1986 Part IV environmental management plans (EPA 2024);
- Long Term Monitoring and Management Plan Requirements for 10-year Permits to Dump Maintenance Dredge Material at Sea (Australian Government 2012);
- Current recommendations for monitoring and impact assessments promulgated by the Western Australian Marine Science Institution (WAMSI) Dredging Science Node;
- Australian National Guidelines for Interactions with Whales and Dolphins (Commonwealth of Australia 2017a);
- Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b); and
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018).

1.4 Environmental Management Framework

Pilbara Ports operations at Port Hedland are subject to the Pilbara Ports Environment and Cultural Heritage Policy. The Policy is the guiding document for environmental management and provides context and specific direction for continuous improvement. The Pilbara Ports Environmental Management Plan (EMP) has been developed to give effect to the commitments in the policy.

The EMP is maintained under Pilbara Ports integrated management system that addresses all activities with a potential to affect the environment. That system is consistent with ISO14001:2015 and its key elements include assessing environmental risk, managing to prevent impacts, monitoring the effectiveness of that management and improving where necessary. The risk assessment process includes undertaking detailed site investigations of the biological and physical environs. Where these investigations identify significant environmental issues, management measures are incorporated into the dredging design to avoid, where practicable, and/or minimise potential impacts. This DEMMP will fit under the Pilbara Ports integrated management system.

The dredging Environmental Risk Assessment and supporting process which forms the foundation of this DEMMP, was transparent and interactive through engagement with the Port of Port Hedland Technical Advisory and Consultative Committee (TACC) and sought to draw upon the best available information.

In compliance with the Pilbara Ports integrated management system, the DCCEEW objectives for sea dumping and EPA 'Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals', the DEMMP sets out:

- Stakeholder consultation;
- The dredging and sea disposal requirements;
- Environmental performance objectives and management strategies and actions to attain them;
- Monitoring to demonstrate that strategies are effective and corrective actions to be undertaken should monitoring suggest performance objectives are not being met;
- Contingency planning to cover failure of management actions;
- Mechanisms directed at the continual improvement of performance; and
- Auditing, reporting and review requirements for the above.

1.5 Technical Advisory and Consultative Committee (TACC)

Pilbara Ports hosts a long-standing TACC for the Port of Port Hedland which meets at least twice per annum to discuss all matters relating to dredging in the Port.

In accordance with the NAGD (2009), the intent and purpose of the TACC is to:

- Provide continuity of direction and effort in protecting the local environment of the Port of Port Hedland in relation to dredging and dredged material disposal;
- Aid communication between stakeholders and provide a forum where points of view can be discussed, and conflicts resolved;
- Assist in the establishment, as appropriate, of longer term permitting arrangements through activities such as the provision of comments, review of plans and integration of activities;
- Review ongoing management of dredging and dumping activities in accordance with the guidelines and permitting arrangements;
- Make recommendations to Pilbara Ports, State agencies and/or relevant Commonwealth agencies as necessary in relation to the above as appropriate.

The main objective of the TACC is to ensure stakeholders have a transparent process with respect to dredging and ocean disposal of dredged material.

The TACC is representative of industry, community and government at all levels, including the following organisations:

- Pilbara Ports (Environment and Heritage Manager, Harbour Master and Dredging and Survey Manager, or their representatives).
- Government organisations:
    - Commonwealth DCCEEW;
    - Western Australian Department of Primary Industries and Regional Development (DPIRD);
    - Western Australian Department of Biodiversity Conservation and Attractions (DBCA) Parks and Wildlife Service; and
    - Western Australian Department of Transport and Major Infrastructure (DTMI).
- Community Stakeholders:
    - Kariyarra Aboriginal Corporation (KAC)
    - Town of Port Hedland (TOPH); and
    - Care for Hedland Environmental Association.
- Port Industry and Users:
    - BHP Billiton;
    - Roy Hill; and
    - Fortescue Metals Group (FMG).

1.6 Audit, Review and Document Availability

Pilbara Ports will undertake audits of the dredge contractor(s) and their operations as required throughout the project, to assess compliance against this DEMMP and the SDP. A compliance audit schedule will be developed prior to the start of the Project based on the conditions/obligations contained within the DEMMP/SDP and any other relevant approval documents. It is envisaged that the management and mitigation actions detailed in the DEMMP will form the basis of the audit criteria.

The performance of the dredging operations against these requirements will be reported to the Port of Port Hedland TACC at scheduled meetings of the TACC.

This DEMMP will be reviewed as required and any material changes submitted to DCCEEW and DWER for consideration and approval. A review may be conducted in response to one or more of the following:

- After the SDP is issued; to update the DEMMP with any conditions/obligations contained in the SDP which have not been addressed in the DEMMP.
- After the EPA assessment decision on the Project has been published; to update the DEMMP with any ministerial conditions (if prescribed) which have not been addressed in the DEMMP.
- Following identification of aspects of the DEMMP that are found not to be functional/efficient; and
- If an incident occurs that poses a significant risk of impact.

This DEMMP will be made available on the Proponent's website (www.pilbaraports.com.au) for the life of the SDP.

2 BACKGROUND ON THE PORT OF PORT HEDLAND

2.1 Locality and Use

The Port of Port Hedland is in the Pilbara Region of Western Australia located immediately adjacent to the Port Hedland township, approximately 1,630 kilometres (by road) north of Perth (Figure 1-1).

Pilbara Ports owns and operates four public berths within the port's inner harbour with two additional berths being constructed as part of the Lumsden Project. There are 15 additional private berths (constructed by other entities under State Agreement Acts or a lease or licence agreement with Pilbara Ports), which facilitate the export of bulk minerals such as iron ore. Pilbara Ports' public berths facilitate the trade of bulk minerals (iron ore, manganese, salt, lithium, and copper concentrate), petroleum products, ammonium nitrate, bulk liquids, general cargo, containerised cargo and livestock.

The other uses of the Port (e.g. cultural, recreational and fisheries) are described in Section 4.

2.2 Potential Sediment Contaminant Sources

The port is situated on the confluence of five shallow ephemeral creek systems. Catchment runoff has the potential to provide small amounts of metal contamination, however there is very little fluvial input other than intermittent and heavy runoff associated with seasonal cyclonic events. During these events, many potential contaminants are rapidly flushed out of the relatively short waterways of Port Hedland Harbour (SKM 2008). Given the small and irregular amounts of runoff, this source must be considered unlikely to be significant.

Existing industries in Port Hedland Harbour are generally associated with the trade of bulk minerals (iron ore, manganese, spodumene and copper concentrate), petroleum products, ammonium nitrate, bulk liquids and other general cargo.

The dredge area is located approximately seven (7) kilometres offshore (at its nearest point) from entrance to the inner harbour of the Port of Port Hedland. The majority of this area has not been subject to capital dredging or development previously, with the exception of capital dredging for the Channel Entry Project (CEP). The dredged footprint for the CEP, overlaps the southern area of the dredging footprint proposed for the Project. Capital dredging for the CEP was completed by Pilbara Ports in 2025.

Shipping, and associated stockpiling and loading, activities present the primary risk of contaminant introductions to sediments in the proposed dredge area.

2.3 Dredging History

Historically, Port Hedland was established as a service centre for the pearling, pastoral and gold mining industries. Port Hedland began major redevelopment in the 1960's to service the growing iron ore industry in the region at the time. Maintenance dredging has been undertaken at the Port of Port Hedland since 1977, and several capital dredging programs have been conducted in support of various port expansion projects since that time.

Table 2-1 details the dredge history of the Port of Port Hedland.

Table 2-1. Port Hedland dredging history

Year	Proponent	Type of Dredging	SDP Number (if known)[+]	Dredge Material Volume (m^3)
1977	Pilbara Ports	Maintenance	N/A	150 000
1981	Pilbara Ports	Maintenance	N/A	268,000
1985	Pilbara Ports	Capital and Maintenance	N/A	7,000,000
1986	Pilbara Ports	Capital	N/A	13,600,000
1990	Pilbara Ports	Maintenance	N/A	350,000
1993	Pilbara Ports	Maintenance	N/A	200,000
1994	Pilbara Ports	Maintenance	N/A	114,000
1997	Pilbara Ports	Maintenance	N/A	330,000
2001	Pilbara Ports	Maintenance	N/A	580,000
2002	BHP	Capital	N/A	460,000
2004	Pilbara Ports	Maintenance	N/A	550,000
2006-07	FMG	Capital		5,000,000
2007	Pilbara Ports	Maintenance	SD/2007/0342	730,000
2008	FMG	Capital		3,400,000
2009	BHP	Capital		3,900,000
2010	BHP	Capital		6,000,000
2010	Pilbara Ports	Capital	SD2010/1722	8,800,000[#]
2010	Pilbara Ports	Maintenance	SD/2007/0342	930,000

Year	Proponent	Type of Dredging	SDP Number (if known)[+]	Dredge Material Volume (m^3)
2012	Pilbara Ports	Capital	SD2011/2142	5,880,000[#]
2012	Pilbara Ports	Maintenance	SD/2007/0342	312,850
2012	BHP	Capital		1,720,000
2013	Pilbara Ports	Maintenance	SD2013/2402	680,839
2014	Pilbara Ports	Maintenance	SD2013/2402	344,789
2015	Pilbara Ports	Maintenance	SD2013/2402	473,395
2016	Pilbara Ports	Maintenance	SD2013/2402	272,048
2017	Pilbara Ports	Capital	SD2017/3542	3,361,000[#]
2018	Pilbara Ports	Capital	SD2019/3782	400,000[#]
2018	Pilbara Ports	Maintenance	SD2017/3702	102,686
2019	Pilbara Ports	Maintenance	SD2017/3702	381,608
2021	Pilbara Ports	Maintenance	SD2017/3702	974,512
2021	Pilbara Ports	Capital	SD2018/3782	72,719
2022	Pilbara Ports	Capital	SD2018/3782	89,073
,2023	Pilbara Ports	Capital	SD2022/4042	48,455
2023	Pilbara Ports	Capital	SD2021/4009	48,457
2024	Pilbara Ports	Capital	SD2022/4041	135,499
2024	Pilbara Ports	Maintenance	SD2022/4041	239,420
2025	Pilbara Ports	Capital	SD2022/4042	20,954

Year	Proponent	Type of Dredging	SDP Number (if known)+	Dredge Material Volume (m^3)
2025	Pilbara Ports	Maintenance	SD2022/4041	116,313

+ permits issued prior to 2004 did not have a permit number. Dashed line indicates permit number is not known.
# Volumes approved under the sea dumping permit, but not necessarily dredged

2.4 Existing Sediment Chemistry Information

Testing of sediments for previous dredging programs in Port Hedland has been undertaken on many occasions by a range of proponents. Whilst many of the dredging programs have involved sediment sampling programs within the inner harbour areas, sampling has also been undertaken in offshore areas since 1997. Table 2-2 details the previous sediment testing campaigns conducted in offshore areas, in and around the Channel, and includes any noteworthy contaminants which exceeded screening levels of guidelines.

Past studies, specific to the current project area, including the most recent survey (MScience 2022a), have identified some metal concentrations (e.g. arsenic, chromium and nickel) above the screening guidelines. Arsenic and nickel concentrations have been observed to be consistently above NAGD screening levels across all surveys. It has been shown that these concentrations are widespread, naturally occurring and bound to fine sediments, and thus considered unlikely to be of concern for unconfined ocean disposal (Stoddart et al. 2019).

On the basis of past investigations of sediment chemistry from the inner harbour (Appendix A) and offshore areas of the Port of Port Hedland (Table 2-2), the contaminants of concern depend mainly on the sediment type and presence of naturally occurring metals. This is summarised below:

- The distribution of contaminants has been confined largely to the fine sediments in the upper stratum (0.5 m);
- The detection of contaminants has been more likely to occur in the sediments of high vessel traffic areas and previously dredged areas such as channels that accumulate fine sediments;
- Consolidated sediments underlying upper soft strata have been unlikely to contain contaminants above screening levels;
- Consolidated sediments and calcarenite have tended to be effectively impermeable to contamination by particulate matter and to migration of dissolved contaminants in pore waters;
- Naturally occurring concentrations of arsenic, chromium and nickel are present within the Port of Port Hedland and the Pilbara region;
- Historically, exceedance of TBT has occurred most often around the oldest berths within the inner harbour of the port. A single sample collected in 2004 between Channel Beacon 40 and 41 exceeded the NAGD screening level for TBT (at 18.5 µg Sn/kg) (URS 2004a). The current risk of high

levels of TBT within the proposed dredge area is low, as TBT has been banned on vessels which use the port since 2008 or earlier;

- The presence of petroleum hydrocarbons has typically been low; and
- All previous surveys conducted have confirmed that the sediment quality meets the applicable guidelines for safe ocean disposal at that time.

Table 2-2. Port Hedland Channel sediment characterisation history

Project (Reference)	Proponent*	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal#
		TBT**	Metals	Organics	
Dredging of Harbour and Channel (CMP&F 1997)	PHPA	-	-	-	Yes
Dredging of Harbour and Entrance Channel (ENV 2000)	PHPA	-	-	-	Yes
Dredging of Harbour and Entrance Channel (ENV 2001)	PHPA	-	Nickel in the channel	-	Yes
Maintenance Dredging (URS 2004b)	PHPA	-	-	-	Yes
Maintenance Dredging (URS 2004a)	PHPA	-	Nickel and arsenic in the channel	-	Yes
Maintenance Dredging (sampling incl Spoil Gnd 'I') (Koskela Group 2007)	PHPA	-	Nickel and arsenic in the channel	-	Yes

Project (Reference)	Proponent*	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal#
		TBT**	Metals	Organics	
Outer Harbour Development (SKM 2011)	BHPBIO	-	Arsenic in surficial sediments in all areas surveyed. Chromium and nickel at depth in borehole samples.	-	Yes
Maintenance Dredging (sampling incl Spoil Gnd 'I') (Worley Parsons 2012)	PHPA	-	-	-	Yes
Spoil Ground 'I' Extension (Worley Parsons 2015)	PPA	-	-	-	N/A+
Maintenance Dredging (sampling incl Spoil Gnd 'I') (Jacobs 2015)	PPA	-	-	-	Yes
Maintenance Dredging (GHD 2016)	PPA	-	-	-	Yes
Channel Risk and Optimisation Project (CROP) (sampling incl Spoil Gnd 7) (Jacobs 2017)	PPA	-	Arsenic in the channel, refuge zone and spoil grounds. Appears to be naturally elevated.	-	Yes
Channel Entry Project (CEP) (MScience 2022a)	Pilbara Ports	-	Arsenic in Zone A and B. Appears to be naturally elevated.	-	Yes

Project (Reference)	Proponent*	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal#
		TBT**	Metals	Organics	
Port Hedland Annual SAP Implementation for Maintenance Dredging (sampling incl Spoil Gnd 7) (MScience 2022b)	Pilbara Ports	-	-	-	Yes
Zone 5 Bypass Channel Project (MScience 2025a)	Pilbara Ports	-	-	-	Yes

- not detected above screening value

*Port Hedland Port Authority (PHPA) transitioned to Pilbara Ports Authority (PPA) in 2014 and is now known as Pilbara Ports.

**TBT screening levels increased from 5 µg/kg to 9 µg/kg when NODGDM was superseded by the NAGD (Commonwealth of Australia 2009) in early 2009

if contaminants found above their relevant screening levels, subsequent elutriate, bioavailability and/or toxicity testing found if sediments were safe for ocean disposal

+ N/A - not applicable since survey was designed for sediment characterisation only and/or the project did not seek an application for ocean disposal

3 DREDGING AND SEA DISPOSAL REQUIREMENTS

3.1 Dredge and Disposal Locations

3.1.1 Dredging Areas

Pilbara Ports is proposing to conduct capital dredging to create a bypass navigation channel. The dredging footprint occurs to the east of Zone 5 of the existing Channel (Figure 3-1). The bathymetry of Zone 5 is predominantly greater than 10 metres depth with scattered shoal patches, one of which lies close to the Channel with water depths of 8 metres at lowest astronomical tide (LAT).

The bypass navigation channel design depth is -11.5 m chart datum (CD) and would be 200 m wide between the designed toelines. In order to achieve a design depth of -11.5 mCD, Pilbara Ports have provisioned for an average maximum vertical over-dredge of 1.0 m, bringing the average maximum vertical design depth to -12.5 mCD. The inclusion of the 1 m over-dredge to the overall design will allow for the tooth depth of a cutter suction dredge (CSD), in the event small areas of consolidated material are identified that cannot be removed by the TSHD (refer to Section 3.3.1 for details).

Capital dredging within the channel design profile is likely only required in two discrete areas, designated 5A(ii) and 5A(iii) (Figure 3-1), that have been shown via hydrographic survey to be above the channel design depth. The majority of dredging will occur in 5A(iii). The area designated 5A(i) is below the designated channel design depth but above the maximum vertical design depth of -12.5 mCD, so identification of this area has been included as a potential dredging area for due diligence purposes.

The characteristics of the proposed dredge area are detailed in Section 3.4 and 4 of this DEMMP.

3.1.2 Disposal Areas

An established spoil ground (Spoil Ground 7 [SG7]) previously approved for spoil disposal and used in several recent capital and maintenance dredging campaigns will be used for spoil disposal. Recent campaigns have used sub-areas SG7A and SG7B inside the SG7 boundaries. These areas are too shallow for the expected draft of the TSHD and disposal for the Project will target sub-area SG7C inside the greater SG7.

The spoil ground location is shown in Figure 3-1 and its coordinates are provided in Table 3-1. Characteristics of the disposal site are detailed in Section 3.4 and 4 of this DEMMP.

Management and allocation of space within existing spoil grounds is the responsibility of Pilbara Ports and is subject to consultation with its Port Hedland TACC. The estimated capacity within the proposed spoil ground is detailed in Section 3.4.3.

Table 3-1. Spoil ground coordinates

Spoil Ground	Latitude	Longitude
Spoil Ground 7C	20°11.851'S	118°26.827'E
	20°11.847'S	118°27.344'E
	20°13.544'S	118°26.841'E
	20°13.540'S	118°27.358'E

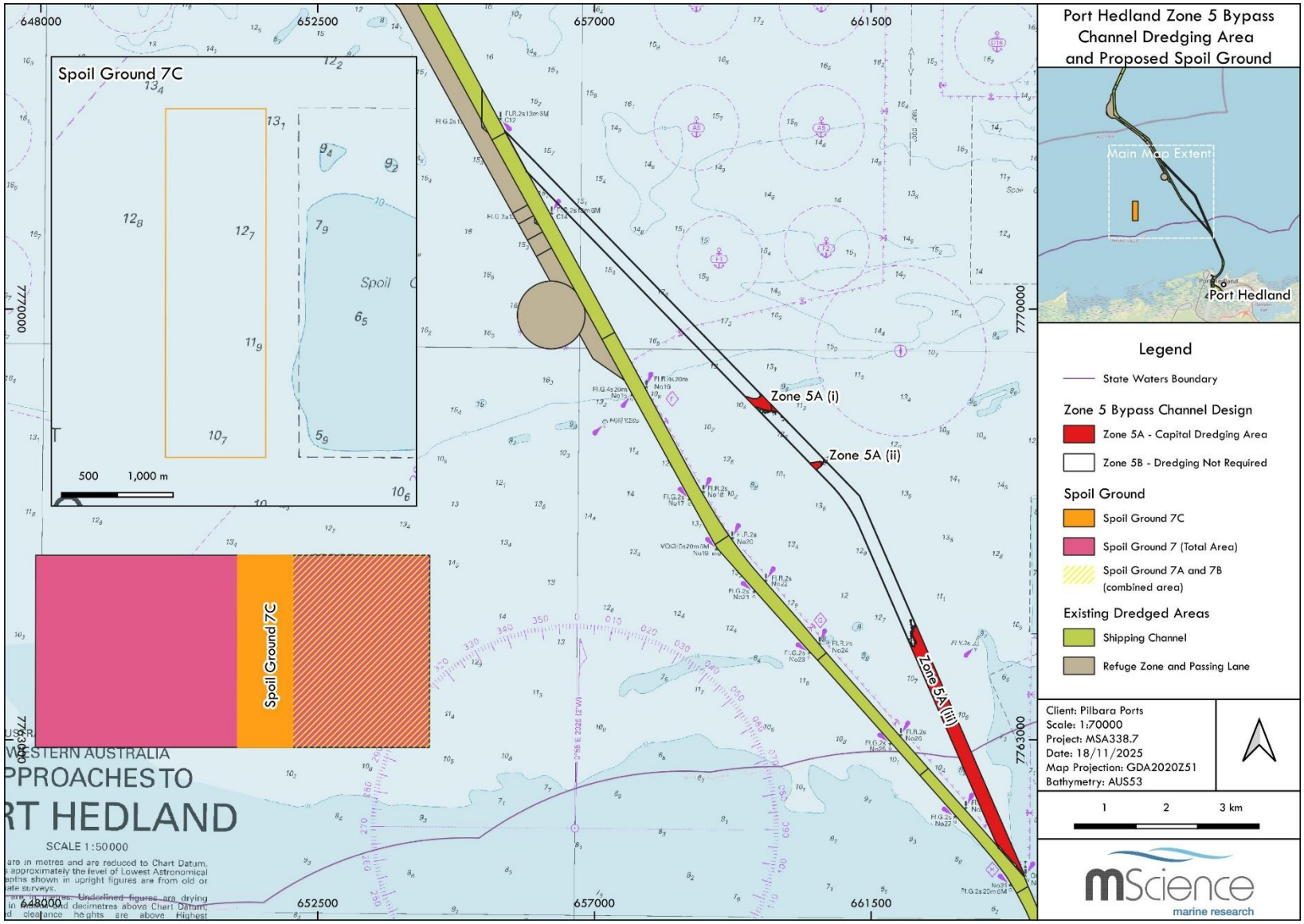

Figure 3-1. Dredging and disposal locations

3.2 Dredge Volume

The maximum volume of dredged material to be removed under the largest dredging scenario would be 800,000 m^3.

3.3 Dredge Campaign Methodology

3.3.1 Dredging

The dredging program is expected to take up to five (5) weeks with a planned commencement in August/September 2026, once all necessary approvals for the Project have been granted. The exact timing and duration of the works will depend on the availability and size/capacity of the dredge offered by the preferred contractor. The capital dredging program is planned to be conducted in conjunction with the annual maintenance dredging of Pilbara Ports port facilities at the Port of Port Hedland.

Port Hedland is characterised by hard, abrasive and variably cemented calcareous materials. Two dredging methodologies are considered viable to dredge this material and may be implemented:

- Method 1: Trailing Suction Hopper Dredge (TSHD) only
    - rip and loosen seabed material;
    - Immediately dredge the loosened material by suction; and
    - transport material directly to Spoil Ground 7C for disposal.
- Method 2: Crushing using a Cutter Suction Dredge (CSD) with rehandling by a TSHD
    - Mechanically crush hard material in situ using CSD;
    - Place crushed material back onto the seabed; and
    - Enable a TSHD to subsequently re-handle and dispose of material to Spoil Ground 7C.

A TSHD is a self-propelled vessel equipped with one or two drag arms (each with an attached drag head), powerful pumps and a hopper to store the dredged material. The drag arms are lowered so the drag heads can be trailed across the seabed where material is to be dredged. Suction induced by the dredge pumps generates a strong flow field about the drag head intakes. This flow field entrains particles of bed material. A solids-water mixture is formed, drawn in through the drag heads, up suction pipes in the drag arms and is pumped into the hopper. The coarser-sized solids deposit more rapidly inside the hopper to form a material bed, while some finer-sized particles remain suspended in water overlying the hopper bed. As dredging continues the surface level of the water in the hopper rises till it reaches the (adjustable) level of a weir. Excess water then leaves the hopper by overflowing the weir and is conveyed through an overflow pipe to a discharge point at the base of the vessel. The overflow discharge carries with it suspended solids (predominantly finer, more slowly settling fractions of the dredged material) that have not been retained in the hopper.

A CSD with side casting capabilities is hydraulic vessel that breaks up hard material with a rotating cutter head and immediately discharges the slurry to the side of the cut via a short pipeline. CSD's are anchored in position, and moved forward, by spud poles. Once removed from the seabed, material is uplifted by the TSHD and is pumped into the hopper.

The boundary of the dredging area and spoil grounds will be displayed live on the screen of the dredger, along with the position of the dredger and associated equipment e.g. trailing arms / head. This will ensure dredging activities stay within the boundary of the approved dredging areas.

3.3.2 Disposal

On completion of loading, the dredge will sail to the nominated spoil ground where its contents are discharged by opening the doors or valves in the hopper bottom. Release of the dredged material will typically be managed to preferentially fill deeper sections of the disposal site, although vessel safety and navigational constraints will dictate the exact location of any individual dump. Rate and duration of discharge will depend on the dredging plant selected. Vessel speed during release will vary as a function of the water depth at the site and the type (gradation and cohesiveness) of material being released. Release of the dredged material will be managed to ensure that the spoil ground is filled in an organised and consistent manner. Once empty, the dredge returns to the dredge area where the cycle is repeated. The position of the dredge will always be monitored and recorded by a vessel positioning system, which will allow the actual track of the vessel to be plotted and the location of individual dump operations to be recorded.

The duration of each disposal event (including positioning and hopper rinsing) may be up to 30 minutes, however, the active disposal phase (when most of the material is discharged through the bottom doors) is typically less than 10 minutes.

3.4 Characteristics of Dredge and Disposal Sites

Potential dredge areas are shown in Figure 3-1 (refer Section 3.1.1). The proposed disposal location is within an existing approved spoil disposal ground, used previously as described in Section 3.1.2. The following sections discuss their sediment characteristics. Additional physical and chemical environmental characteristics of the dredge and disposal sites are detailed in Section 4.

3.4.1 Physical Sediment Characteristics

3.4.1.1 DISPOSAL SITE

The following sediment characteristics of the spoil grounds have been derived from samples collected around Spoil Ground 7C during a recent survey of the area (MScience 2022b). The survey identified sediments from sites around Spoil Ground 7C are comprised largely of the sand (62 – 2000 µm) and gravel (>2000 µm) fractions, with the exception of a few sites which reported up to 30% of the fines fraction (<62 µm).

3.4.1.2 DREDGE SITE

Most of the material to be dredged is comprised of unconsolidated marine sediments (calcareous sand, silt, clay, gravel and shells) and coastal limestone (accreted calcarenite, siliceous calcarenite and calcirudite); It is estimated that the unconsolidated marine sediments are restricted to the upper 2 m of seabed (Jacobs 2017; SKM 2011). The particle size distribution of material to be dredged has been derived from samples collected in 2025 as part the current SDP application (MScience 2025a). In general, material in the Zone 5 Bypass Channel design is between 80 to 90% sand (62 – 2000 µm) and gravel (2000 – 10000 µm) with smaller amounts (~10%) of fines (<62 µm).

3.4.2 Chemical Sediment Characteristics

3.4.2.1 DISPOSAL SITE

The most recent analyses of sediment samples taken from the immediate surrounds of Spoil Ground 7C returned concentrations below NAGD screening levels for most metals and organic contaminants (i.e. TBT and hydrocarbons) concentrations (MScience 2022b). Previous testing of sediments from SG7 in 2017

(Jacobs 2017) also found the 95%UCL for arsenic to be above NAGD guidelines. At the time of sampling the area had not yet been used as a spoil ground, as such, it is suggested that arsenic concentrations are naturally high in the Port Hedland region. The occurrence of high concentrations of arsenic at inshore sites throughout the Pilbara is known to be widespread and naturally occurring (Stoddart et al. 2019).

3.4.2.2 DREDGE SITE

The most recent chemical characterisation of sediment within the areas to be dredged occurred in 2025 as part of the current SDP application (MScience 2025a). The survey found all metals, TBT and hydrocarbon concentrations to be below the initial screening levels described in the NAGD or consistent with high naturally occurring background concentrations.

3.4.3 Spoil Ground Capacity and Sediment Flux

Table 3-2 provides an indication of the theoretical capacity remaining at the existing spoil grounds based on the most recent available hydrographic survey data. Use of any spoil ground for disposal of dredged material under the current SDP will be subject to agreement following consultation with the Port Hedland TACC.

Table 3-2. Capacity of proposed spoil ground

Spoil Ground	Theoretical Ceiling Depth (m CD)*	Area (ha)	Estimated Capacity (m^3)+
Spoil Ground 7C	-8.0	281	10,075,550

* Nominated ceilings have been set by Pilbara Ports (in consultation with the Port Hedland TACC) based on limits set for safe navigation (for transit over the spoil grounds) and sediment dispersion modelling / assessments.

+ Capacities derived from calculations undertaken by Pilbara Ports using hydrographic survey data available for the spoil ground at the time of developing this DEMMP.

Based on a visual assessment of the differences between bathymetric surveys conducted following disposal of dredge spoil between 2017 and 2022 within sub areas A and B of Spoil Ground 7, there is no evidence to suggest material deposited within Spoil Ground 7 is migrating outside of the spoil ground boundaries. The visual assessment was further supported by a volume analysis of post disposal bathymetric survey data collected in 2019 and 2022. The change in volume between the 2019 and 2022 survey was compared against the total volume of dredge spoil deposited at the disposal site. The change in volume was calculated as 0.3%, and the difference in volume was 9.84×10^{-4} m^3 per square meter of the spoil ground. This is considered well below the error of the survey methodology +/- 10 cm i.e. 0.1 m^3 per meter square), and as such may not related to any actual change in sediment volume. On the basis of both the visual assessment and volume analysis, Pilbara Ports considers that Spoil Ground 7 is retentive.

No dredging-related impacts on water quality were recorded at sensitive coral habitats nearest to Spoil Ground 7 during the intensively monitored three year CROP dredging program which used Spoil Ground 7 for part of its spoil disposal, despite the occurrence of several major cyclones over that period (MScience 2018a; MScience 2018b; MScience 2019).

3.5 Sediment Sampling and Analysis Plan

In order to maintain currency of valid sediment quality data over the duration of the SDP and to ensure that spoil remains suitable for ocean disposal in accordance with the NAGD, a SAP was developed, approved by DCCEEW and implemented. The results of the implemented SAP have been summarised in Section 3.4. The SAP implementation report and this DEMMP form part of the SDP application.

The SAP was developed and implemented between 11 – 13 July 2025 and approved by the DCCEEW post facto on 14 August 2025.

4 ENVIRONMENTAL, SOCIAL AND CULTURAL VALUES

4.1 Environmental Setting

A detailed description of the marine environment offshore from Port Hedland has been provided in Appendix A. A summary of the environmental setting has been provided in the following sections.

4.1.1 Physical Environment

The marine environment offshore from Port Hedland is connected to the wider Indo-Pacific biogeographic region through the Leeuwin and Holloway Currents (BHP 2009). Prevailing winds are west to north westerly during the warmer months (September to April), and northerly and easterly during the cooler months (May to August). During the warmer months, wind strength tends to increase throughout the day and is strongest in the afternoons, whilst the opposite occurs in the cooler months (BOM 2025). The north-westerly winds average between 20 and 25 km/h and easterly winds typically between 15 and 20 km/h.

Tropical cyclones generally occur between November and April in the Pilbara. Winds in excess of 250 km/hr, torrential rain, storm surges, large waves and substantial movement of coastal sediments can be experienced during cyclones.

Typically, swell and waves approach the Pilbara coast from the north and north-west as a result of Southern Ocean swell refracted by the regional bathymetry and islands of the North West Shelf (Semeniuk 1996). The tidal regime of the area is predominantly semi-diurnal and range from 1.5 m during neap tides to 6.0 during springs, with the highest astronomical tide being 7.9 m (BHP 2009).

The natural current direction in the local area is north westerly to south easterly. Influences on the currents and circulation in the North West Shelf include the Indonesian through-flow current, the Western Australian current, the Leeuwin current, cyclones and large tidal ranges. The large tides drive oscillating currents of around 1 m/s (BHP 2009). Under cyclonic conditions, large waves, strong winds and storm surges can be created which can significantly alter current and wave energy patterns, and subsequent background water quality conditions (APASA 2009).

Marine waters within the Port of Port Hedland are typically well mixed and subjected to substantial variation in water quality following rainfall events and inflows from five shallow creek systems that discharge into the harbour.

Sediment resuspension occurs more readily in nearshore to mid-shore waters (depths between 5 to 10 m CD) during major tidal changes or strong winds, compared to offshore locations or deeper waters (greater than 10 m CD). Nearby estuaries and land-based run-off during the outgoing tide deposit fine material in the inshore areas, further increasing turbidity (BHP 2009). The deeper, offshore, waters of the North West Shelf are characterised by a relatively clear water column.

Studies have shown that local variation in exposure to wind and wave conditions may cause areas of the Port of Port Hedland to react differently from adjacent areas. Baseline monitoring was implemented over a 12 month period for the Outer Harbour Development (SKM 2009a). That study showed median turbidity recorded at inshore, mid-shore and offshore sites was 6, 4.6 and <2 NTU, respectively.

A long term study of turbidity offshore of Port Hedland established four sites to monitor turbidity over three dredging phases implemented between October 2017 and August 2019 for the Channel Risk and Optimisation Project (CROP) (MScience 2018a; MScience 2018b; MScience 2019). The mean turbidity at

all sites ranged from 0.64 to 1.93 (Phase 1, 95%ile turbidity not exceeding 6 NTU), 0.64 to 1.17 (Phase 2-1, 95%ile turbidity not exceeding 3.5 NTU) and 2.8 to 6.9 (Phase 2-2, 95%ile turbidity not exceeding 25 NTU). The measurements recorded during Phase 2-2 of the CROP dredging program were influenced by the passing of Tropical Cyclone Veronica.

4.1.2 Biological Environment

The distribution and composition of subtidal benthic communities and habitats off the coast of Port Hedland have been described previously for the proposed BHP Outer Harbour Development (SKM 2009b), and habitats within and adjacent to the proposed dredging and disposal footprint were verified during a recent benthic habitat assessment (MScience 2025b).

Nearshore environments are characterised by extensive sand plains of low relief, medium to coarse-grained sand with shell fragments. Exposed limestone outcrops have resulted in the development of protected embayment's, wide salt flats, offshore ridgelines and several offshore islands with associated reef communities.

Hard corals identified within Port Hedland are not true coral reefs as they occur on limestone structures rather than on the basis of calcium carbonate accretion (SKM 2009b). Extensive coral surveys undertaken by SKM (2009c) recorded a total of 51 coral species from 19 genera from the offshore environment of Port Hedland, dominated by massive, encrusting and foliose morphologies. The species richness of coral taxa is very low in comparison to other studies carried out in the Pilbara region. The dominant coral taxon is *Turbinaria*, with other subdominant taxa including species of Faviidae, Poritidae and branching *Acropora*.

Fifty-eight macroalgal species have been recorded at Port Hedland (Huisman et al. 2008). SKM (2009b) reported extensive stands of the green algae genera *Caulerpa* and *Halimeda*, with transient stands of the brown alga *Sargassum.* The presence and abundance of macroalgae commonly varies substantially between seasons as they are strongly driven by environmental factors such as water clarity, nutrient availability and sand movement (Huisman et al. 2008). *Sargassum spp*, which was one of the most prolific species recorded during field surveys exhibits strong seasonal growth patterns, indicating the cover of macroalgae in the Port Hedland region is likely to vary greatly dependant on seasonal conditions.

Four species of seagrass have previously been identified offshore of Port Hedland (Walker and Prince 1987); *Thalassia hemprichii*, *Halodule uninervis*, *Halophila ovalis*, and *Halophila decipiens*. However, seagrass is uncommon in the vicinity of Port Hedland and typically forms rare patches of low to medium densities of ephemeral species which are spatially and temporally dynamic

Several important migratory marine species occur within Port waters, at least seasonally. The Port overlaps a biologically important area (BIA) for humpback whales. The species can be seen in the Port during their annual northern migration from Antarctic feeding grounds to tropical waters (late July to early August) and during their return to the Antarctic (Late August to mid October). Coastal dolphin species (e.g. Australian Humpback Dolphin, Australian Snubfin Dolphin and Spotted Bottlenose Dolphins) can occur year-round within the Port's waters. Dugongs are also known to occur within the Port in shallow nearshore waters, although the lack of extensive seagrass (foraging) habitat is likely to limit numbers.

Four species of turtles are known to occur within the Port. The flatback turtle is known to commonly nest on beaches in the Port Hedland area and these nesting beaches, and their inter-nesting buffer, are designated BIAs (Commonwealth of Australia 2017b; Pendoley 2009; Pendoley 2019; Pendoley 2005;

Prince 1993). A foraging BIA for flatback, green, hawksbill and loggerhead turtles has been defined extending from the De Grey River area out to the North Turtle/Little Turtle islands,

The Port of Port Hedland is part of the Western Australian State-Wide Array Surveillance Program (SWASP) for introduced marine species that has been operating in Western Australian Ports since August 2016. The SWASP is a collaborative effort between all the WA Port Authorities and the DPIRDs Aquatic Biosecurity section. *D. perlucidum* is the only introduced marine species that has been detected during monitoring conducted for the SWASP in the Port of Port Hedland.

4.2 Social and Cultural Setting

4.2.1 Local and Regional Setting

The Port of Port Hedland is in the Pilbara Region of Western Australia located immediately adjacent to the Port Hedland township, approximately 1,630 kilometres (by road) north of Perth.

Pilbara Ports owns and operates four public berths within the port's inner harbour with two additional berths being constructed as part of the Lumsden Project. There are 15 additional private berths (constructed by other entities under State Agreement Acts or a lease or licence agreement with Pilbara Ports), which facilitate the export of bulk minerals such as iron ore. Pilbara Ports public berths facilitate the trade of bulk minerals (iron ore, manganese, salt, lithium, and copper concentrate), petroleum products, ammonium nitrate, bulk liquids, general cargo, containerised cargo and livestock.

Port Hedland, and the wider region, has historically been the subject of numerous large-scale infrastructure developments, including extensive and periodic capital and maintenance dredging campaigns.

4.2.2 Cultural Values

The Port Hedland region contains a diverse range of Aboriginal heritage sites and objects, including petroglyph (rock art) sites, ethnographic sites, shell middens, artefact scatters, quarries and grinding patches.

Port Hedland is situated within the traditional Country of the Kariyarra People. The Kariyarra People Native Title claim (National Native Tribunal File No. WCD2018/015) was determined in December 2018, and the Kariyarra Aboriginal Corporation is the Registered Native Title Body Corporate representing the interests of the Kariyarra People. However, the Native Tile ruling also determined that Native Title has been extinguished over the majority of Port vested land and waters, including the project area.

Pilbara Ports maintains an active program of Aboriginal heritage consultation and management. Previous consultation with Kariyarra Traditional Owners undertaken during capital dredging and other port developments at Port Hedland has not identified any underwater archaeological heritage sites or ethnographic values within or nearby to the project area.

Pilbara Ports (2025) completed a desktop assessment of the potential for cultural heritage to be encountered during activities undertaken for the proposed Zone 5 Bypass Channel in accordance with Section 4.2 of Pilbara Ports' Cultural Heritage Management Plan (CHMP). The CHMP is publicly available on Pilbara Ports' website. The assessment considered the results of previous cultural heritage surveys undertaken within the Port Hedland area and subsequent identified heritage sites; the geology and topography of Port Hedland, and the likely impacts sea level rises (post-Last Glacial Maximum) would have on presently submerged coastlines and potential evidence for past human occupation. The assessment

concluded the current proposed program has a very low probability of encountering extant cultural heritage and is, therefore, unlikely to result in impacts to heritage sites.

4.2.3 Marine Protected Areas

There are no existing or proposed marine parks or reserves which overlap the proposed Zone 5 Bypass Channel design or SG7C footprint, or which are expected to be impacted by the proposed dredging activities.

The nearest Marine Parks are the Commonwealth Dampier Marine Park (approximately 100 km west of Port Hedland), that forms part of the North-west Australian Marine Reserves Network, and Eighty Mile Beach Marine Park (approximately 200 km north-north-east of Port Hedland). A management plan for the North-west Commonwealth Marine Reserves Network, which covers the Dampier Marine Park and Eighty Mile Beach Marine Park, was prepared by the Commonwealth in 2018 (Director of National Parks 2018).

4.2.4 Fisheries and Recreational Use

Recreational fishing is popular in the Port Hedland area; recreational fishers target subtidal reefs and rocky shoals offshore such as Cornelisse and Coxon Shoals and Minilya Bank. There would be minimal effects on recreational fishers as the areas targeted for dredging and spoil disposal are largely within those experiencing heavy vessel traffic, and large vessels have priority and 'right of way' within the proposed dredging area. Similarly, while commercial fisheries occur in the general area, these fisheries are unlikely to be impacted by the short-term dredging operations associated with the Project.

State managed fisheries include the:

- Nickol Bay Prawn Fishery;
- Pilbara Demersal Finfish Fisheries;
- Pearl Oyster Fishery Zone;
- Western Australian Mackerel Fishery; and
- North Coast Blue Swimmer Crab Fishery.

Commonwealth managed fisheries include the:

- Western Tuna and Billfish Fishery;
- Skipjack Tuna Fishery; and
- Southern Bluefin Tuna Fishery;

There are no active commercial fisheries in the areas of potential impact (i.e. within 1 km) of dredging and spoil disposal.

The waters off Port Hedland are used extensively for general boating, fishing, swimming and other recreation pursuits by the people of Port Hedland, and other areas of the Pilbara.

5 DREDGING ENVIRONMENTAL FACTORS AND OBJECTIVES

The WA EPA environmental factors and objectives (EPA 2021b) provide a framework against which the environmental performance of the proposed dredging can be measured.

Dredging impacts may occur through a number of pathways (EPA 2016c) and may include:

Direct Impacts:

- the direct removal or destruction of benthic habitat in the dredged area;
- marine fauna collisions/entrainment and disturbance from vessel movements; and
- smothering of benthic organisms in dredge spoil placement locations.
- increased noise and lighting from associated vessel operations.

Indirect Impacts:

- changes to marine water quality from increased turbidity and sedimentation, and reduction in light penetrating the water column at distance from the dredging uplift and spoil disposal;
- introduction of invasive pest species translocated in dredging equipment;
- mobilisation and dispersion of contaminants from dredged sediments during uplift; and
- changes to marine water quality from a hydrocarbon spill or waste discharge from the dredge vessel.

Environmental protection outcomes and management targets for the capital dredging program have been established in accordance with EPA guidance to minimise the potential impacts on the environmental factors and achieve the environmental objectives. Both outcome based and objective based management actions have been set.

The environmental factors and objectives of key relevance to the proposed capital dredging program are provided in Table 5-1.

Table 5-1. Environmental factors and objectives relevant to the capital dredging

Factor	**Objective**
Benthic Communities and Habitats	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.
Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected.
Marine Fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.

6 IMPACT ASSESSMENT

6.1 Context

Pilbara Ports has conducted risk assessment workshops in conjunction with the Port of Port Hedland TACC for previous dredging projects since 2012, including in 2017 and 2022 for the CROP and CEP capital dredging, respectively. As such, the risks associated with dredging at the Port of Port Hedland are well understood. Pilbara Ports has prepared a comprehensive environmental risk assessment (ERA) for the proposed capital dredging associated with the Project (Appendix C). The ERA considered the potential for the Project capital dredging to be run in parallel with Pilbara Ports annual maintenance dredging program.

The ERA identified a range of risks (real and perceived) to the environment, as well as the proposed management strategies to be implemented by Pilbara Ports to ensure these risks were effectively mitigated. Risk knowledge was drawn from experience with past dredging programs at Port Hedland and the outcomes of previous risk workshops held with the Port of Ashburton and Port of Dampier TACC's to support maintenance and capital dredging programs by Pilbara Ports at those ports.

The underlying risk assessment framework that supported and guided the ERA was originally developed based on the CROP dredging and disposal of ~1,900,000 m^3 of dredge material in parallel with Pilbara Ports annual maintenance dredging program over a two-year cycle; a greater volume and length of permit proposed under the current SDP/DEMMP.

The existing ERA was reviewed in 2026 to identify whether the risk profile had changed for the dredging and disposal activities proposed under the current DEMMP, and associated SDP application, to ensure these risks would still be effectively mitigated.

6.2 Environmental Risk Assessment

A detailed description of the risk assessment framework has been provided in Appendix C. In summary, the risk assessment process was conducted in three phases:

1. Risk Identification - what is the activity to be undertaken and what environmental receptors and values (social and cultural) may be impacted?
2. Risk Analysis - Determining the consequence, likelihood and threat posed by each risk on environmental receptors and values.
3. Risk Evaluation, Management and Mitigation - Responses to manage identified risks.

6.3 Assessment Review

Review of the existing ERA in the context of the dredging and disposal activities proposed under the current DEMMP/SDP found:

- There were no direct or indirect impacts to environmental, social or cultural values from the proposed dredging and disposal activities additional to those in the existing register:

- The existing suite of controls to manage impacts to environmental, social and cultural values from capital dredging activities in the Port were considered suitable.

6.4 Assessment Outcomes

Appendix C presents the risk register and outcomes of the ERA.

All environmental, social and cultural values assessed in the ERA were considered to be at low risk of impact as they were suitably managed through Pilbara Ports standard management actions applied through their operational procedures under a business-as-usual model.

Management actions to ameliorate all assessed risks to as low as reasonably practicable have been outlined in Section 7.

Entrainment of turtles and other marine megafauna during dredging operations was the only risk assessed to require management actions in excess of Pilbara Ports' standard operational procedures. As such, monitoring has been specified to allow for adaptive management.

Dredging, both maintenance and capital, has occurred within the Port of Port Hedland extensively over the past 50 years. Environmental management of dredging has been refined over this period on the basis of monitoring studies conducted alongside these programs and advances in international best practice. Comprehensive impact monitoring conducted for previous capital dredging programs has demonstrated that the outcomes of the current assessment, pointing to low risks when management is applied, are realistic.

The most likely dredging scenario proposed would be a single campaign of relatively short duration (~5 weeks) by a TSHD that would not raise turbidity stresses above frequency-intensity-duration combinations predicted to threaten sensitive benthic communities (Jones et al. 2019). However, a dredge and disposal plume monitoring program has been proposed here to check on the assumptions inherent within the ERA.

7 ENVIRONMENTAL MONITORING AND MANAGEMENT STRATEGY

The following sections detail specific actions for the monitoring and management of risks to the environmental, social and cultural values assessed in the ERA.

The management framework template for each environmental, social and/or cultural value has been provided in Table 7-1.

Table 7-1. Monitoring and management framework template

Component	Description
Value	What is to be protected.
Objective	What is intended to be achieved.
Risks Requiring Management	The scenario or activity with a risk of impact to the environmental, cultural and/or social value.
Management Target	Used to indicate the success or otherwise of particular management actions and demonstrate whether proposed objectives are being achieved. Where management thresholds are exceeded, corrective actions/contingency plans are triggered. Is also used as a level of impact that represents the lower end of the likely range (best-case) and used as a target for management to ensure compliance with the environmental protection outcome.
Environmental Protection Outcome	A level of impact that represents the upper end of the likely range (worst-case) and designed to be reflected as an impact limit for any condition of approval.
Management Action	Management actions required to meet the proposed objective(s).
Monitoring Action	Monitoring actions required to meet the proposed objective(s).
Corrective Action / Contingency Plan	Actions and/or plans to be implemented if a performance indicator is not met.
Term (of action)	The period during a dredging campaign when the management action is required to be implemented.
Reporting	The way in which the outcomes of, and compliance with, the management actions are reported.
Responsibility	The responsible party for implementing the items of the framework.

Using the framework template presented in Table 7-1, the following monitoring and management frameworks have been developed to guide the capital dredging program conducted under the approved SDP:

- Section 7.1 Marine Megafauna Management;
- Section 7.2 Marine Environmental Quality (including Benthic Communities and Habitats) Management;

- Section 7.3 Hydrocarbon Management;
- Section 7.4 Introduced Marine Species Management; and
- Section 7.5 Waste Management.

The management framework outlined in Sections 7.1 and 7.2 specifically addresses the EPA environmental factors of key relevance identified in Table 5-1 (Marine Fauna, Benthic Communities and Habitats, Marine Environmental Quality).Management and monitoring actions to measure compliance against proposed management targets and environmental protection outcomes are detailed below.

Management outlined in Sections 7.3, 7.4 and 7.5 addresses the risks associated with general operations of the dredge vessel and can be delivered appropriately through standard operational procedures. As such, only objective-based management targets have been assigned within these management frameworks.

Where responsibility for management actions is assigned to the Dredging Contractor below, the required action will be mandated via the dredge contract.

7.1 Marine Megafauna Management Framework

Value(s)	Marine Fauna
Objective(s)	To protect marine fauna so that biological diversity and ecological integrity are maintained.
Risk(s) Requiring Management	• direct strike by vessels; • inundation by spoil; • physical interaction with the dredge head (turtle specific); • artificial lighting (turtle specific); and • underwater noise during dredge and disposal activities.
Management Target(s)	• No injury or mortality incidents attributable to dredging for any marine megafauna. • Light and noise mitigation measures included in the dredging contractors HSE management plan and implemented for the duration of the dredging campaign. • Compliance with monitoring criteria established below and within the SDP.
Environmental Protection Outcome(s)	• No reported negative impacts on marine fauna attributable to the dredging and disposal activities

Item	Detail	Term	Responsibility
Management Action(s)	Internal training of Marine Fauna Observer(s) (MFO), which provides clear direction on: • How to identify marine megafauna (i.e. cetaceans, dugongs, turtles) that are known or likely to be encountered within the Port (refer to Section 4.3 for known/likely species). • The actions to be undertaken by the observer in the event of marine fauna being sighted within the monitoring zone (see monitoring). • The actions to be undertaken by the observer in the event of an incident resulting in injury or mortality of a marine megafauna species.	Prior to commencement of dredging activities.	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	A trained MFO will be aboard the dredge when the dredge is in motion (see monitoring actions).	At all times during dredging activities	Dredging Contractor
	Vessels will be contractually required to comply with all relevant maritime legislation and operate safely and use only authorised shipping routes for all travel.	At all times during the dredging campaign	Dredging Contractor
	Vessels will comply with all requests from the Australian Maritime Safety Authority (AMSA) and the relevant harbour master unless it is unsafe to do so.	At all times during the dredging campaign	Dredging Contractor
	Vessel tracking systems, including automated identification systems (AIS) will be used on all project related vessels.	At all times during dredging activities	Dredging Contractor
	All dredging vessels will be required to comply with applicable parts of: • AMSA Marine Notice 15/2016; and • Division 8.1 of the EPBC Regulations 2000 regarding vessel interactions with cetaceans (e.g. distance, speeds).	At all times during the dredging campaign	Dredging Contractor
	Ensure that the dredge is fitted with turtle exclusion devices on the drag heads. Dredging is not permitted unless these devices are installed and operational.	At all times during dredging activities	Dredging Contractor
	Implement procedural controls whilst dredging to minimise off-bed suction time.	At all times during dredging activities	Dredging Contractor
	Implement a soft start procedure (i.e. limit suction from the drag head until the drag head is within 2 m of the seabed) whenever commencing dredging.	Prior to dredging activities	Dredging Contractor
	The length of the campaign will be minimised (expected 5 weeks) and planned as far as practicable to minimise overlap with peak turtle nesting and hatchling emergence periods to avoid interactions with marine turtles.	Refer to Appendix A for peak nesting and hatchling emergence periods	Pilbara Ports Dredging and Survey Manager
	Light levels from the dredging and support vessels will be minimised to those lights that are necessary for the safe operation of the vessels.	At night during dredging activities	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	Operational lights will not be directed towards the sea unless required for the safe operation of the vessel.	At night during dredging activities	Dredging Contractor
	Ensure all vessel equipment and machinery is in good condition and subject to regular maintenance to minimise underwater noise.	At all times when engaged on the dredging campaign	Dredging Contractor
	All Project vessels will be operated in accordance with EPBC Regulations 2000 – Part 8 Division 8.1	When in transit throughout the dredging campaign	Dredging Contractor
	Minimise the duration of run-time for vessel engines, thrusters and dredging plant by avoiding stand-by or running mode to the degree practical and consistent with safe operations.	At all times during the dredging campaign	Dredging Contractor
Monitoring Action(s)	A trained MFO must check using binoculars from a high observation platform (vessel bridge) for marine megafauna within a 300 metres monitoring zone. If marine megafauna are sighted within the monitoring zone, dredging and disposal activities must not commence until 30 minutes after the last individual is sighted/observed to leave the monitoring zone or the vessel is to move to another area to maintain a minimum distance of 300 m between the vessel and the observed megafauna.	Prior to dredging and disposal activities, during daylight hours	Dredging Contractor
	Monitoring for the presence of injured or dead turtles will be conducted by: • Examining the spoil in the dredge hopper for fragments of turtle; and • Checking the dredge wake for floating turtles or turtle fragments.	Regular checks (after each uplift of spoil at a minimum)	Dredging Contractor
Corrective Action(s) / Contingency Plan	In the event that turtle injury or mortality occurs as a result of the dredging campaign completed under the SDP, the incident will be investigated. The investigation will inform the implementation of two trigger levels to guide the management action(s): **Level 1** One injured or dead turtle is found during the dredging campaign which is attributable to Project activity.	As soon as practicable after an incident has occurred.	Pilbara Ports Environment and Heritage Manager

Item	Detail	Term	Responsibility
Corrective Action(s) / Contingency Plan	Action: • Report the incident as per the reporting section • Check that all management procedures are being implemented. If not, then ensure implementation and increase compliance checks i.e. ensure pumping procedures and inspections of turtle chains are being carried out by the dredge contractor each time the drag head is lifted. **Level 2** More than one turtle is found injured or dead during the dredging campaign attributable to Project activity. Action: • As per Level 1 • If management measures were being implemented, conduct a review of the current management measures to identify alternative or additional practical management measures that could be undertaken	As soon as practicable after an incident has occurred.	Pilbara Ports Environment and Heritage Manager
Reporting	Records of MFO training/attendance for each person nominated as MFO for the dredging campaign.	Prior to and for the duration of the dredging campaign.	Dredging Contractor
	Records of all marine fauna observations made during monitoring will be established and maintained. The log shall include (as a minimum) the following information: date, name of MFO, time (commencement of pre-dumping observations), time (completion of pre-dumping observations), whether marine megafauna were sighted in the monitoring zone during the pre-dumping monitoring period, type of marine species identified (where possible), general comments on animal behaviour, description of mitigation measures undertaken, time (commencement of dumping) and time (completion of dumping).	For the duration of the dredging campaign.	Dredging Contractor
	Report any incident involving marine fauna to the Pilbara Ports Dredging and Survey Manager and Environment and Heritage team. Record the date, time and nature of each incident as well as a description of the species involved.	As soon as practicable after an incident is observed, but within 12 hours.	Dredging Contractor

Item	Detail	Term	Responsibility
Reporting	Report any injury or mortality of marine turtles or other threatened or specially protected fauna to: • The Department of Biodiversity, Conservation and Attractions (DBCA) Pilbara Regional Office (9182 2000) or Wildcare Helpline (9474 9055); and • The Department of Climate Change, Energy, the Environment and Water on 1800 803 732 or protected.species@environment.gov.au	Within 72 hours of receiving notification of the incident	Pilbara Ports Environment and Heritage Manager

7.2 Marine Environmental Quality (including BCH) Management Framework

Value(s)	• Marine environmental quality • Benthic communities and habitats • Marine fauna
Objective(s)	To maintain the quality of water and manage sedimentation to ensure that any subsequent impacts to benthic communities and habitats and marine fauna are restricted to the zone of impact as defined in the SDP application.

Risk(s) Requiring Management	• Direct loss of benthic communities and habitats due to dredging outside the approved area.
	• Increased suspended sediment concentrations within the water column from dredging and disposal activities:
	  ○ Associated decrease in light and increase in sedimentation rates to benthic environments.
	  ○ Associated effect on marine fauna and flora in the water column and on the seabed.

Management Target(s)	• Marine environmental quality to be maintained to a 'Moderate Level of Ecological Protection' during dredging and disposal activities. • No dredging or direct disturbance to BCH outside approved dredging footprint and designated spoil grounds. • No reduction of BCH within the Zone of Influence (ZoI). • No incidences of marine fauna injury or death as a result of turbidity impacts • Conduct appropriate turbidity plume validation monitoring (see Section 8) during dredging and disposal activities. • Minimal mounding of spoil within the spoil ground. • Dredges and dredging meet the management actions specified below. • All dredge material to be disposed of within the boundaries of the approved spoil ground.
Environmental Protection Outcome(s)	• Marine environmental quality to return to a High Level of Ecological Protection within one month following completion of dredging and disposal activities. • No direct loss, or irreversible damage, to BCH outside of the Zone of High Impact (ZoHI) • No sublethal impacts to BCH within the ZoI from increased TSS or sedimentation associated with dredging and disposal activities • No negative impacts on marine fauna attributable to the dredging and disposal activities

Item	Detail	Term	Responsibility
Management Action(s)	Dredging will adapt to forecast weather conditions (e.g. storm surges, or strong winds and currents).	At all times during dredging activities	Dredging Contractor
	The dredge plant will utilise mechanical devices to reduce turbidity generation during dredging and disposal, such as turbidity-reducing ("green") valves in the overflow of the dredge.	At all times during dredging activities	Dredging Contractor
	The dredge hopper doors will be kept in good condition to minimise loss of sediment during transport.	At all times during dredging activities	Dredging Contractor
	Dredging and disposal will only occur in the permitted areas specified on approved plans and with material approved in the Sea Dumping Permit.	At all times during dredging activities	Dredging Contractor
	Dredge plant will be managed to ensure that there is no visible evidence of oil, grease, scum, litter or other objectionable matter in the water.	At all times during dredging activities	Dredging Contractor
	All practical measures will be implemented to minimise the concentration of suspended solids released during the loading and disposal of dredge material.	At all times during dredging activities	Dredging Contractor
	Routes to and from the spoil ground will be selected to consider safety and environmental impacts, and to minimise the risk of spillage outside of defined areas.	At all times during dredging activities	Dredging Contractor
	Accurate positioning systems will be used on the dredge plant to ensure direct impacts are restricted to the approved dredging and disposal areas.	At all times during dredging activities	Dredging Contractor
Monitoring Action(s)	Implement dredge and disposal plume monitoring program (as defined in Section 8).	Daily during active dredging activities	Pilbara Ports Environment and Heritage Manager
	Auditing of condition, positioning and sailing routes of the dredging plant.	Throughout the dredging campaign	Pilbara Ports Dredging and Survey Manager

Item	Detail	Term	Responsibility
Monitoring Action(s)	Conduct bathymetric survey at the nominated spoil ground(s) for the specified dredge and disposal campaign to evaluate changes in seafloor bathymetry.	Prior to dumping activities commencing and within one month of the conclusion of all dumping activities under the SDP	Pilbara Ports Dredging and Survey Manager
Corrective Action(s) / Contingency Plan	Investigate any incidents of dredging and/or disposal of dredged material outside of approved areas. Assess the potential risk to environmental, social and cultural values the incident may have had. Amend DEMMP when relevant.	As soon as practicable after an incident is observed	Pilbara Ports Dredging and Survey Manager
Reporting	Provide daily track plots of the dredge plant (or certified extract of the ships logs) to the Pilbara Ports Dredging and Survey Manager. Including (as a minimum): • the dates and times of when each dumping run commenced and finished. • The track of all dredge vessels (as determined by GPS) during dredging activities and transit between the dredging area(s) and the nominated spoil ground(s); and • the position (as determined by GPS) of the dumping vessel at the commencement of dumping (i.e. hopper doors opened) and at the completion of dumping (i.e. hopper doors closed), including the path/track taken during dumping.	Daily during dredging activities	Dredging Contractor
	Incident report for dredging and/or disposal of dredged material outside of approved areas provided to Pilbara Ports Dredging and Survey Manager. Including (as a minimum) details of the incident, the measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.	Throughout the dredging campaign	Dredging Contractor

7.3 Spill (Hydrocarbon and Chemical) Management Framework

Value(s)	• Marine environmental quality • Benthic communities and habitats • Marine fauna • Social surroundings
Objective(s)	To maintain the quality of water, sediment and biota so that environmental and social values are protected.
Risk(s) Requiring Management	• Hydrocarbon/chemical spill event or unplanned discharge from a vessel associated with dredging activities.
Management Target(s)	• No discharges of hydrocarbons to the marine environment. • Compliance with Ship Oil Pollution Emergency Plan. • Compliance with Marine Order 91 – Oil (as relevant to vessel class). • Number of hydrocarbon spills to marine environment.

Item	Detail	Term	Responsibility
Management Action(s)	All chemical substances used on the dredge plant must comply with the dredge contractor's chemical management system. At a minimum, all chemicals must be recorded in a chemical register and maintained for the duration of the dredging campaign, which identifies the chemical properties of the substance, storage and handling requirements and any potential for environmental harm.	For the duration of the dredging campaign.	Dredging Contractor
	Dredge vessels shall develop and implement a Ship Oil Pollution Emergency Plan (SOPEP). Operational spill management controls to prevent hydrocarbon and other spills into the marine environment during dredging activities should include (as a minimum): • Spill control equipment/materials available on-board. • Daily inspection logged for excessive oil and grease from drag heads. • Complying with vessel traffic management protocols. • Detailed records will be maintained of all vessel collision incidents. • Bunkering of larger vessels (e.g. TSHD) will occur at facilities suitable for larger vessel.	For the duration of the dredging campaign.	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	• Bunkering will occur in accordance with the standard operating procedures for the facility being used. • The hydraulic oil systems on all vessels will be well maintained and regularly inspected with appropriate maintenance records and certificates. No obvious leaks. Vessels will be equipped with standard low pressure alarms and shut down systems to minimise hydrocarbon loss in the event of a burst hydraulic hose. • Regular and documented maintenance of all vessels and equipment. • All hydrocarbons stored on deck will be bunded in a secured area. • Relevant employees and contractors involved in the storage, handling, transfer and disposal of fuel and other materials will be trained to ensure they are aware of their responsibilities, systems, processes and procedures. • Relevant contractors will be required to undertake spill response training and appropriate training exercises in accordance with their plans. • Trained and certified crew members present on-board. • AIS on all vessels. • Regular drills and exercises for crews.	For the duration of the dredging campaign.	Dredging Contractor
Monitoring Action(s)	Should a significant hydrocarbon spill occur within the Proponent's dredge design area during the life of the SDP a further sediment sampling program (consistent with the NAGD) would be required to update the sediment quality assessment conducted for the application for SDP.	Prior to maintenance dredging of the dredge design area.	Pilbara Ports Environment and Heritage Manager
Corrective Action(s) / Contingency Plan	Implement oil spill response measures in accordance with the requirements of Pilbara Ports Marine Pollution Contingency Plan for the Port of Port Hedland.	Immediately on notification of spill incident.	Pilbara Ports Environment and Heritage Manager
Reporting	Any incident of discharge of hydrocarbons or chemicals to the marine environment (irrespective of quantity / volume) shall be reported to Pilbara Ports Port Hedland VTS on VHF 12 or 16, or alternatively by telephone on (08) 9159 6556 or 24-hour emergency mobile 0428 888 800.	Immediately after incident.	Dredging Contractor

Item	Detail	Term	Responsibility
Reporting	Investigation report on any hydrocarbon or chemical spill incident shall be submitted to Pilbara Ports Dredging and Survey Manager, including (as a minimum) details of the incident, the response measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.	Immediately (but no later than 12 hours) from the incident occurring	Dredging Contractor
	Waste discharges will be reported to the WA Department of Transport Marine Environmental Emergency Response Unit (for all spills within State Waters), or AMSA (spills outside of State Waters). • WA DoT - discharges will be reported using the Marine Pollution Report form (POLREP) via email. This can be accessed online https://www.transport.wa.gov.au/imarine/reporting-marine-oil-pollution.asp. • AMSA - discharges will be reported using procedures found at https://www.amsa.gov.au/marine-environment/marine-pollution/mandatory-marpol-pollution-reporting.	Immediately (but no later than 12 hours) from the incident occurring	Dredging Contractor

7.4 Invasive Marine Species Management Framework

Value(s)	• Benthic communities and habitats • Marine fauna
Objective(s)	To prevent the introduction and/or spread of IMS to the marine environment at Port Hedland via vessels associated with dredging and disposal.
Risk(s) Requiring Management	• Dredging vessels/plant and associated support vessels have the potential to transport IMS to site as biofouling or in ballast water.
Management Target(s)	• No establishment or movement of IMS within waters adjacent to the development as a result of the Project's dredging and spoil disposal activities. • Compliance throughout the Project with Pilbara Ports IMP Risk assessment process. • Compliance with Australian Quarantine inspection Service (AQIS) mandatory ballast water requirements.

Item	Detail	Term	Responsibility
Management Action(s)	Biosecurity risk of vessels is managed through pre-arrival reporting and assessment. All project vessels will be subject to a marine pest and biofouling risk management procedure consistent with relevant Commonwealth and State biosecurity requirements Verification of vessel biofouling management documentation prior to arrival in Australian territorial waters, including reporting through the Department of Agriculture, Fisheries and Forestry (DAFF) Maritime Arrivals Reporting System (MARS).	For the duration of dredging and disposal activities.	Dredging Contractor
	All vessels engaged for a dredging campaign mobilising from interstate or international waters will be required to undertake Port of Port Hedland's Vessel Introduced Marine Pest (IMP) Risk Assessment Procedure and submit the outcomes to Pilbara Ports. Associated evidence includes: • Vessel specifications. • Most recent antifoul certificate. • Most recent IMP inspection report	Prior to entry to the port and commencement of dredging activities.	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	• Evidence of marine growth prevention systems (MGPS) or manual treatment / clean of internal seawater intakes and pipework's. The risk assessment must indicate the vessel(s) pose a low risk of introducing IMS to Port of Port Hedland waters.		
	Based on the outcomes of each IMP assessment, implement management measures commensurate with the risk (e.g. treatment of internal systems, IMP inspections or cleaning) to minimise the likelihood of IMP being introduced.	Prior to entry to the port and commencement of dredging activities.	Dredging Contractor
	Project vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements (DAWE 2017, version 7) and in accordance with the *Biosecurity Act 2015.*	For the duration of the dredging campaign.	Dredging Contractor
Monitoring Action(s)	Maintain records of vessel compliance with Port of Port Hedland's Vessel Introduced Marine Pest (IMP) Risk Assessment Procedure	For the duration of the dredging campaign.	Pilbara Ports Environment and Heritage Manager
Corrective Action(s) / Contingency Plan	Should a marine pest listed on the Australian Priority Marine Pest List (APMPL) be detected (or suspected to be present), notify DPIRD via the FishWatch line 1800 815 507. DPIRD officers would then determine what management was required.	Within 24 hours of becoming aware of the issue.	Pilbara Ports Environment and Heritage Manager
Reporting	Provide evidence through Port Hedland's IMP Risk Assessment Process to Pilbara Port Environment and Heritage Team. Information on how biofouling is being managed to be reported through the DAFF Maritime Arrivals Reporting System (MARS).	Prior to vessel(s) entering the Port of Port Hedland	Dredging Contractor

7.5 Waste Management Framework

Value(s)	• Marine environmental quality • Benthic communities and habitats • Marine fauna • Social surroundings
Objective(s)	To minimise the risk of waste discharges to the marine environment and the resulting environmental and social impacts.
Risk(s) Requiring Management	• Unauthorised discharges of solid or liquid hazardous waste to the marine environment (and the subsequent environmental and social impacts).
Management Target(s)	• Compliance with Port of Port Hedland Handbook Section 11.13 Waste Disposal Guidelines (includes MARPOL requirements). • No unauthorised discharges of solid or liquid hazardous waste to the marine environment. • Number of incidents where waste has entered the marine environment, or incorrect storage / segregation. • Vessel premobilisation to include checks and information on waste management practices.

Item	Detail	Term	Responsibility
Management Action(s)	All vessels will manage wastes in accordance with the requirements of the Pilbara Ports Port of Port Hedland Handbook (Section 11.13 Waste Disposal Guidelines). This includes management for sewage, grey water, oil or oily mixtures, garbage (food and cargo residue), deck washing / cleaning, waste incineration and other controlled wastes.	For the duration of the dredging campaign.	Dredging Contractor
	Controlled waste, including hydrocarbons and oily water, shall be stored in appropriately labelled receptacles and be correctly disposed of ashore not to be discharged to sea. Controlled waste shall be disposed of ashore (as required) via licenced controlled waste contractor, and waste tracking sheets to be retained.	For the duration of the dredging campaign.	Dredging Contractor
	Solid and liquid wastes and hazardous materials shall be stored in appropriately labelled receptacles and be correctly disposed of ashore (as required) through a licenced waste contractor, and waste tracking sheets to be retained.	For the duration of the dredging campaign.	Dredging Contractor

Item	Detail	Term	Responsibility
Monitoring Action(s)	Housekeeping inspections to ensure appropriate storage of waste and no accumulation of waste materials in work areas.	For the duration of the dredging campaign.	Dredging Contractor
Corrective Action(s) / Contingency Plan	In the event that waste is lost overboard, all reasonable and practicable measures must be employed to retrieve the waste.	For the duration of the dredging campaign.	Dredging Contractor
	Implement waste clean-up and/or other corrective actions as required by Pilbara Ports.	For the duration of the dredging campaign.	Dredging Contractor
Reporting	Certificate to demonstrate sewage treatment / disinfection system is approved in accordance with MARPOL and International Sewage Prevention Certificate provided to Pilbara Ports Dredging and Survey Manager and Environment and Heritage department.	Prior to commencing work under the Pilbara Ports contract.	Dredging Contractor
	Report the following to Pilbara Ports Dredging and Survey Manager and Environment and Heritage department: • Vessel garbage disposal log for all discharges to shore. • Waste delivery receipts for all discharges to shore. • Controlled waste tracking forms for controlled waste (hydrocarbons and oily water).	For the duration of the dredging campaign.	Dredging Contractor
	Any incident of discharge (e.g. uncontrolled or unauthorised) of solid or liquid wastes to the marine environment (irrespective of quantity / volume) shall be reported to Pilbara Ports Port Hedland VTS on VHF 12 or 16, or alternatively by telephone on (08) 9159 6556 or 24-hour emergency mobile 0428 888 800.	Immediately after incident.	Dredging Contractor
	Investigation report on any solid or liquid waste spill incident shall be submitted to Pilbara Ports Dredging and Survey Manager, including (as a minimum) details of the incident, the response measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.	Within 24 hours of a reportable incident.	Dredging Contractor
	Uncontrolled and unauthorised waste discharges will be reported to the WA Department of Transport Marine Environmental Emergency Response Unit (for all spills within State Waters), or AMSA (spills outside of State Waters).	Immediately (but no later than 12 hours) from the incident occurring	Dredging Contractor

Item	Detail	Term	Responsibility
Reporting	• WA DoT - discharges will be reported using the Marine Pollution Report form (POLREP) via email. This can be accessed online https://www.transport.wa.gov.au/imarine/reporting-marine-oil-pollution.asp. ○ POLREPs are required for any illegal vessel discharge to the marine environment. • AMSA - discharges will be reported using procedures found at https://www.amsa.gov.au/marine-environment/marine-pollution/mandatory-marpol-pollution-reporting.	Immediately (but no later than 12 hours) from the incident occurring	Dredging Contractor

8 OPERATIONAL MONITORING PROGRAM

A dredge and disposal plume monitoring program will be undertaken to support the management measures listed in Section 7.2 for marine environmental quality (including BCH).

Monitoring compliance with other management measures, such as for marine fauna management, hydrocarbon, chemical and waste management, IMS assessments and vessel management will be undertaken by a rolling audit program.

8.1 Dredge and Disposal Plume Monitoring

8.1.1 Rationale

The water quality monitoring program has been designed based on the numerical modelling predictions of plume dispersal for the proposed capital dredging, and the assumption that biota of the area have survived water quality impacts of previous dredging and disposal campaigns over time frames of several months, compared to the less than five-week period anticipated for the dredge campaign covered under this DEMMP.

A validated hydrodynamic model was used to force a sediment transport model (DHI 2026) to simulate the two potential dredging methodologies outlined in Section 3.1.1 (TSHD only and CSD/TSHD) over three metocean scenarios. The predicted total suspended sediment concentration (SSC) fields were assessed against the 'possible' and 'probable' 1, 3, 7, 14 and 28 day running mean threshold criteria from Jones et al. (2019) so that the maximum envelope of each running mean window could be calculated. The largest footprint for both 'possible' and 'probable' effects was predicted to occur for the 14-day running mean during both dredging methodologies. As such, the maximum envelope for the 'possible' and 'probable' 14-day running mean threshold criteria of both dredging scenarios was combined to define the likely worst-case and best-case Zone of Moderate Impact (ZoMI). A Zone of High Impact (ZoHI) was defined as the direct disturbance footprint for dredging and disposal (best-case boundary), including a 50 m buffer (worst-case boundary).

The model of plume dispersal for the proposed capital dredging predicted plumes with a SSC ≥5 mg/L above background may disperse up to 15 km from the site of dredging and disposal. This area has been defined as the Zone of Influence (ZoI), and is corroborated by the monitoring of dredge and disposal plumes conducted during past capital dredging campaigns at Port Hedland in which plumes were shown to be visible up to 15 km around dredging and disposal. (MScience 2018a; MScience 2018b; MScience 2019).

Sensitive receptor sites offshore of Port Hedland are known to be located at Weerdee Reef, Spoil Ground Reef, Minilya Bank and Cornelisse Shoal (Figure 8-1). These known sensitive receptor sites are not located within the defined ZoHI, ZoMI or ZoI. As such, it is unlikely that any measurable impacts will be recorded at these sites.

To confirm the predicted impacts are accurate, the extent and concentration of the actual turbid plume generated by the proposed dredging and disposal activities will be monitored.

8.1.2 Objectives

Key objectives for monitoring of dredge and disposal plumes during dredging activities are to:

1. Confirm plumes outside of the predicted zones of impact do not exceed intensity-frequency-duration criteria which result in mortality of benthos.
2. Inform ongoing dredging and spoil disposal activities and any requirement to manage these.

8.1.3 Methodology

Monitoring of suspended sediment concentrations in surface waters (<5 m) at the dredging and disposal sites will be conducted using imagery from NASA's Moderate Resolution Imaging Spectroradiometer (MODIS), the monitoring will include:

- Assessment of the location and extent of the visible plume around dredge and disposal sites using MODIS satellite imagery on a daily, or twice daily, basis dependent on the availability and quality of the MODIS satellite images. The plume location would be assessed from an image compiled from MODIS red-green-blue (RGB) channels; and
- Estimation of suspended sediment concentration (expressed as Total Suspended Sediment in mg/l - TSS) above background TSS. TSS estimates would be made as the average of a 3x3 block of pixels with the centre pixel at the points shown in Figure 8-1 for impact and background sites using MODIS digital band data and the WAMSI algorithm of Dorji et al. (2016): where both images for a day are available, the estimated TSS would be the average of the two images estimated TSS.

8.1.4 Management Triggers

If the dredge plume is found to extend to sensitive receptor monitoring locations (Fig. 8-1), then the following management triggers would apply:

Trigger Level 1: A plume of intensity greater than 1 mg/l above background (derived from reference site data) present over any individual impact monitoring site shown in Figure 8-1 for three (3) consecutive days.

Trigger Level 2: A plume of intensity greater than 10 mg/l above background (derived from reference site data) present over any individual impact monitoring site shown in Figure 8-1 for three (3) consecutive days, or a plume of >1 mg/l above background over any individual impact site for seven (7) consecutive days.

8.1.5 Adaptive Management

Exceedance of the Level 1 trigger will invoke:

- a review of dredging and metocean conditions to investigate the cause of the exceedance and to improve the speed of any response to exceedance of a Level 2 trigger; and
- adaptation of dredging to reduce potential impacts if practical.

Exceedance of a Level 2 trigger will require alteration of the dredging activity which caused the exceedance. This might take the form of one or more of the following:

- Relocating the dredge to a different area;
- Altering the dredging cycle; and/or
- Disposing of spoil in a different area of the spoil ground.

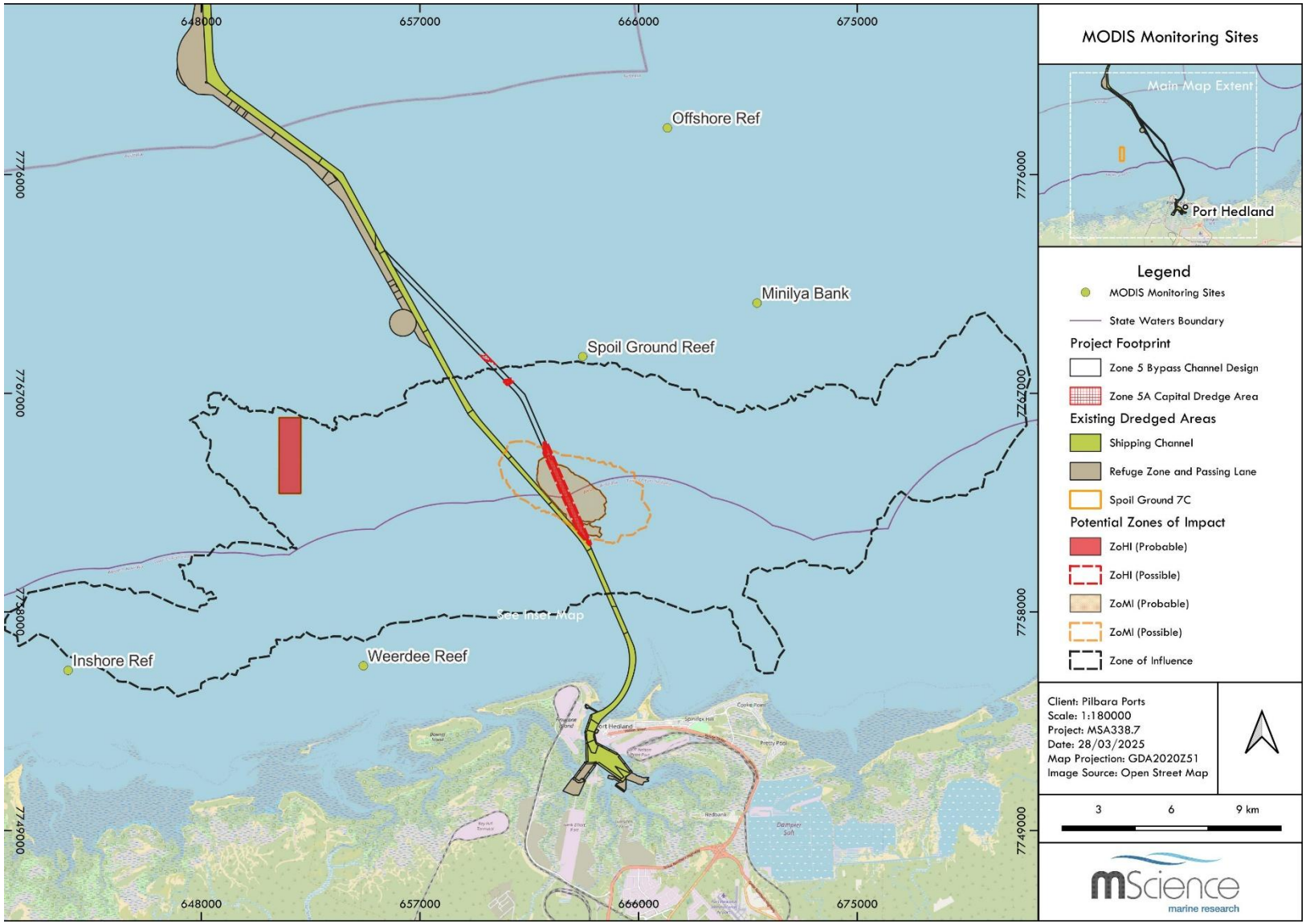

Figure 8-1. Proposed MODIS monitoring sites

8.1.6 Reporting

During dredging, the daily location of plumes will be reported to the Pilbara Ports Environment and Heritage Manager within 24 hours of MODIS satellite capture.

A summary of estimated TSS and test results will be held in a data file as raw data and rolling means. The Pilbara Ports Environment and Heritage Manager will be notified as soon as practicable after an exceedance is identified.

Within three months of completion of the dredge campaign, a report will be compiled which:

- Lists all recorded data and exceedances,
- Describes the spatial extent of plumes. All plumes will be amalgamated to produce an estimate of the 'realised plume' or Zone of Influence to demonstrate the area potentially impacted.

9 ROLES AND RESPONSIBILITIES

Pilbara Ports is ultimately responsible for the implementation of the DEMMP. The dredging contractor(s) is responsible for the implementation of relevant environmental management as per Table 9-1, including appropriate staffing of the dredge in accordance with Pilbara Ports contract conditions, the DEMMP and the SDP.

The positions and responsibilities of key roles are presented in Table 9-1.

Table 9-1. Roles and responsibilities

Position	Responsibilities
Pilbara Ports Dredging and Survey Manager	• Overall responsibility for the DEMMP. • Overall responsibility for compliance with statutory obligations. • Ensure dredging and disposal is conducted safely and in accordance with the DEMMP. • Oversees implementation of bathymetric/hydrographic surveys.
Dredge Contractor	• Prepares and implements an Environment Management Plan (EMP) in accordance with this DEMMP and Pilbara Ports EMP. • Implements management actions. • Ensures staff have the correct training. • Ensures equipment is maintained.
Pilbara Ports Environment and Heritage Manager	• Liaises with the DCCEEW on matters pertaining to the SDP/DEMMP. • Obtains approvals from the DCCEEW for any necessary variations or amendments of the SDP/DEMMP. • Complies with the requirements of this DEMMP. • Oversees implementation of environmental controls, monitoring programs, inspections and audits. • Oversees monitoring and compliance reporting. • Provides advice on environmental issues as required.
All personnel involved in the dredging campaign	• Comply with this DEMMP and other legal requirements. • Exercise a Duty of Care to the environment. • Report all environmental incidents.

10 REPORTING

Table 10-1 summarises the reporting requirements pre, post and during dredging works under the DEMMP/SDP.

Table 10-1. Summary of reporting

Report	Details	Frequency/ schedule	Prepared by	Submitted to
General				
Sea Dumping Permit International Reporting Requirements	To facilitate DCCEEW reporting to the International Maritime Organisation	• Annual • On expiry of SDP	Pilbara Ports	DCCEEW
Port Hedland TACC Report	Performance of the dredging operations against requirements of the DEMMP and SDP	At a scheduled TACC meeting for each year in which dredging occurs	Pilbara Ports	TACC
Specific to Management of Marine Environmental Quality (including BCH)				
Dredge and Disposal Plume Monitoring Report	Results of monitoring and management actions taken. Including trigger exceedances	• Final report within three months after completion of the dredging campaign • Exceedance reporting is reactive	Environmental contractor	DCCEEW (and Pilbara Ports)
Hydrocarbon/ Chemical Spill Report	Incident report on spill to marine waters including response measure implemented	Notification: Immediately Per occasion	Dredge contractor	Pilbara Ports
		Report: Within 12 hours of spill	Dredge contractor	Pilbara Ports[1]
Unauthorised Waste Discharge Report(s)	Incident report on waste discharge to marine waters including response measure implemented	Notification: Immediately Per occasion	Dredge contractor	Pilbara Ports[1]
		Report: Within 12 hours of discharge	Dredge contractor	Pilbara Ports
Bathymetric Survey Report	Results of pre and post bathymetric surveys of spoil grounds	Report within two months of completing the post dredging hydrographic survey	Hydrographic surveyor contractor	Pilbara Ports DCCEEW

Report	Details	Frequency/ schedule	Prepared by	Submitted to
Plotting Sheets	Time/date and GPS position of each dumping run	Provided to Pilbara Ports as a summary report on agreed basis (e.g., weekly) and on completion of the project.	Dredge contractor	Pilbara Ports
Specific to Management of Marine Fauna				
Marine Fauna Incident Report	Notification of incident	Immediately Per occasion	Dredge contractor	Pilbara Ports
		Within 72 hours of incident	Pilbara Ports	DCCEEW
Marine Fauna sighting Reports	Record of marine fauna observations	Updated for every observation Provided to Pilbara Ports as a summary report on agreed basis (e.g., weekly).	Dredge contractor	Internal
Specific to Management of Introduced Marine Species				
Introduced Marine Species Reports	Vessel Inspections reports and identification notifications	Identification Notification: within 24 hours Inspection Report: Prior to vessel(s) entering the Port of Port Hedland.	Dredge contractor	DPIRD

[1] Following an incident Pilbara Ports will prepare and submit initial incident reports to DWER (within 24 hours of the incident) and to DCCEEW (within 72 hours of the incident).

11 DELIVERABLE ACTIONS

Table 11-1 summarises the deliverable actions pre, post and during dredging works under the LTDMP/SDP.

Table 11-1. Deliverable actions

Action	Reference section of DEMMP	Where	Who	When
Pre-dredging				
Dredging contract contains provisions for compliance with DEMMP	7	Not applicable	Pilbara Ports Dredging and Survey Manager	Contract in place prior to commencement of each dredging campaign
Bathymetric Survey	7.2	Spoil ground proposed for dredging campaign	Hydrographic surveyor	Complete prior to commencement of each dredging campaign
IMP Risk Assessment Procedure	7.4	Port of departure before arrival in Port of Port Hedland	Dredge contractor	Complete prior to vessel arrival within Port of Hedland limits
Dredging				
Marine Fauna Monitoring	7.1	At dredging location and spoil ground proposed for campaign	Dredge contractor	During dredging and disposal activities
Dredge and Disposal Plume Monitoring	7.2	Monitoring sites/area listed in Section 8	Environmental contractor	Throughout the dredging campaign
Vessel in correct location	7.2	Within approved dredge footprint or spoil ground	Dredge contractor	During dredging and disposal activities
Post-dredging				
Bathymetric Survey	7.2	Spoil ground proposed for campaign	Hydrographic surveyor	One month post dredging

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APPENDIX A – EXISTING ENVIRONMENT AT PORT HEDLAND

METOCEAN CONDITIONS

Climate

Air temperatures along the Pilbara coast vary from mean maximum temperatures in the high twenties during the cooler months (May to August) and low to mid-thirties (centigrade, ^{o}C) during the warmer months (September to April) (BOM 2025). Records show March to have the highest mean maximum temperature of 36.8^{o}C, with July the lowest mean maximum of 27.4^{o}C (BOM 2025). January has the highest mean minimum temperature of 25.7^{o}C with July further recording the lowest mean minimum temperature of 12.5^{o}C.

Monthly and annual rainfall is highly variable with the majority of rain falling during the warmer months as a result of tropical low pressure systems. Mean annual rainfall for Port Hedland is 315.6 mm with highest mean rain falling in February 90.5 mm, and lowest mean rainfall in October is 0.9 mm (BOM 2025).

Winds

Prevailing winds are west to north westerly during the warmer months (September to April), and northerly and easterly during the cooler months (May to August). During the warmer months wind strength tends to increase throughout the day and are strongest in the afternoons, whilst the opposite occurs in the cooler months (BOM 2025). The north westerly winds average between 20 and 25 knots and easterly winds typically between 15 and 20 knots.

Tropical cyclones generally occur between November and April in the Pilbara. Winds in excess of 250 km/hr, torrential rain, storm surges, large waves and substantial movement of coastal sediments can be experienced during cyclones.

Waves, Tides and Currents

Typically, swell and waves approach the Pilbara coast from the north and north-west as a result of Southern Ocean swell refracted by the regional bathymetry and islands of the North West Shelf (Semeniuk 1996). The tidal regime of the area is predominantly semi-diurnal and range from 1.5 m during neap tides to 6.0 during springs, with the highest astronomical tide being 7.9 m (BHP 2009).

The natural current direction in the local area is north westerly to south easterly. Influences on the currents and circulation in the North West Shelf include the Indonesian through-flow current, the Western Australian current, the Leeuwin current, cyclones and large tidal ranges. The large tides drive oscillating currents of around 1 m/s (BHP 2009). Under cyclonic conditions, large waves, strong winds and storm surges can be created which can significantly alter current and wave energy patterns, and subsequent background water quality conditions (APASA 2009).

Water Quality

Waters of the North West Shelf are usually temperature-stratified, with sea surface temperatures (SST) attaining a mean temperature of 29.3°C in March, dropping to 24°C in August (Pearce et al. 2003).

Marine water quality in the region is heavily influenced by seasonal patterns and incidences of extreme weather. Typically, nearshore waters are characterised by variable turbidity and high sedimentation rates, with associated highly variable light regimes and seawater temperatures. Offshore waters exhibit fewer extremes in the water quality, but still display occasional high levels of sedimentation and turbidity, low

light and variable seawater temperatures (BHP 2009; SKM 2009a). In general, light, turbidity, seawater temperature and sedimentation rates are weather dependent and show a strong seasonal transition from the dry to the wet seasons. Large daily tidal ranges (>5 m), strong winds (gusts >50 km/h) and increased wave activity (such as associated with cyclonic activity) can impact background conditions resulting in increased turbidity (in the form of increase total suspended solids (TSS)) due to coastal runoff and wind/wave driven sediment resuspension. In summary, waters in the vicinity of the Project are subject to naturally elevated levels of turbidity and a reduced light climate heavily influenced by seasonal weather patterns.

Nutrient concentrations from the nearshore waters of the Port of Port Hedland are considered oligotrophic (BHP 2009). During the warmer months, blooms of nitrogen-fixing microbes such as *Trichodesmium* or mangrove mud-flat cyanobacteria are known to occur and may contribute significantly to the nutrient budget, however there have been no known deleterious water quality impacts caused by toxic algal blooms in the region (Heyward et al. 2000).

Coastal waters of the North West Shelf are generally very high quality, the concentration of metals are low by world standards. Localised elevations of some metals have been reported adjacent to the industrial centres and port operations of Port Hedland (O2 Marine 2024; Wenziker et al. 2006).

Turbidity and TSS

Water quality investigations have been undertaken throughout the Port of Port Hedland, often as part of compliance monitoring in association with dredging and construction activities. More recently Pilbara Ports has collected water quality data within the inner harbour as part of its marine environmental quality management program. Quarterly monitoring implemented under this plan between 2020 and 2023 showed a mean turbidity value of 4.5 NTU.

Sediment resuspension occurs more readily in nearshore to mid-shore waters (depths between 5 to 10 m CD) during major tidal changes or strong winds, compared to offshore locations or deeper waters (greater than 10 m CD). Nearby estuaries and land-based run-off during the outgoing tide deposit fine material in the inshore areas, further increasing turbidity (BHP 2009). The deeper, offshore, waters of the North West Shelf are characterised by a relatively clear water column.

Past studies of water quality within the Port of Port Hedland have typically addressed turbidity, with suspended sediment concentration measured only occasionally. While there will be a relationship between these parameters, that will vary dependent on the particle size distribution of suspended sediment, the optical properties of sediments, the water depth and spectral properties of light reaching the sediments.

Studies have shown that local variation in exposure to wind and wave conditions may cause areas of the Port of Port Hedland to react differently from adjacent areas. Baseline monitoring was implemented over a 12 month period for the Outer Harbour Development (SKM 2009a). That study showed median turbidity recorded at inshore, mid-shore and offshore sites was 6, 4.6 and <2 NTU, respectively.

A long term study of turbidity offshore of Port Hedland established four sites to monitor turbidity over three dredging phases implemented between October 2017 and August 2019 for the Channel Risk and Optimisation Project (CROP) (MScience 2018a; MScience 2018b; MScience 2019). The mean turbidity at all sites ranged from 0.64 to 1.93 (Phase 1, 95%ile turbidity not exceeding 6 NTU), 0.64 to 1.17 (Phase 2-1, 95%ile turbidity not exceeding 3.5 NTU) and 2.8 to 6.9 (Phase 2-2, 95%ile turbidity not exceeding 25 NTU).

The measurements recorded during Phase 2-2 of the CROP dredging program were influenced by the passing of Tropical Cyclone Veronica.

MARINE HABITATS

The distribution and composition of subtidal Benthic Communities and Habitats (BCH) off the coast of Port Hedland, including the Project area, have been described previously for the proposed BHP Outer Harbour Development (SKM 2009b) (Figure A - 1). The distribution and extent of BCH within the extensive outer harbour study area (~3,650 km^2, extending 50 km east and west of Port Hedland Inner Harbour, and 40 km seaward) was modelled and predicted using a combination of Light Detection and Ranging (LiDAR) data and ground truthing surveys. The outer harbour study area was observed to be dominated by sand plains, devoid of benthic primary producers, interspersed with a series of hard substrate ridgelines (running parallel to the coastline) capable of supporting BCH.

Prediction of the presence of a biota or substrate class in a given location was reliant on a benthic percentage cover of ≥5%. Consequently, the presence of one class did not preclude the presence of another; intermingling of classes was common. For biota classes, benthic primary producers (BPP) and non-BPP, this was particularly so across the hard bottom ridgelines. Validation established that there was a high degree of confidence in the model outputs.

Modelling predicted the study area to be comprised of the following substrate classes:

- 88% sediment;
- 7% hard substrate;
- 3% sediment covered hard substrate (when two categories above predicted in same location); and
- 2% not modelled with confidence.

Biota classes, either BPP or non-BPP, were predicted to occur in isolation or mixed assemblages over 13% of the study area. Presence of biota in the study area was predicted as follows:

BPP:

- hard coral: 5.0% (of which 2.8% was predicted to occur in isolation);
- macroalgae: 4.4% (2.2% in isolation); and
- seagrass: could not be modelled as it was not recorded at enough sites in the study area.

Non-BPP:

- invertebrates including sponges, soft corals, ascidians: 5.6% (2.8% in isolation).

Of areas where biota were predicted, 5.2% occurred in mixed assemblages (13% - 2.8% (hard coral) – 2.2% (macroalgae) – 2.8% (non-BPP))

In relation to BPPH, habitat modelling of the study area predicted the following percentage covers:

- 86.7% was non BPPH (sand or sediment not capable of supporting BPP);
- 11.5% was BPPH; and
- 1.8% could not be accurately modelled.

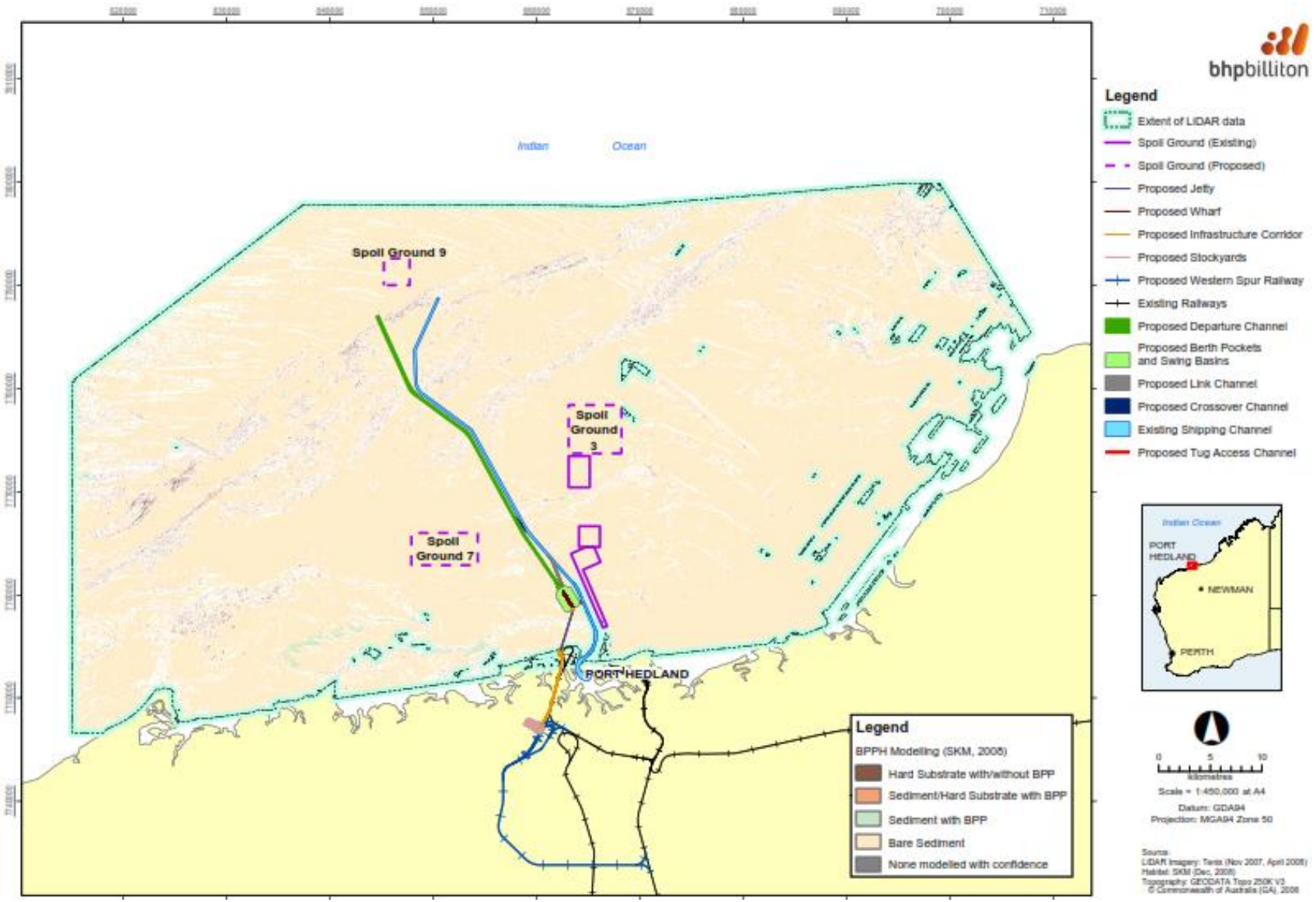

Figure A - 1. Distribution of benthic communities and habitats off the coast of Port Hedland from SKM (2009) combined habitat map.

Benthic habitat, biota or community structures considered to be endemic, especially unique or of regional significance have not been identified within the study area. BPPH was not observed to support dense or complex BPP communities. Likewise, no unique organisms or communities were observed on non BPPH areas.

Marine Habitats Specific to the Project

A ground truthing survey specific to the Project was completed to provide a greater certainty and precision in the location and structure of known BCH within and adjacent to the Zone 5 Bypass Channel dredging design and SG7C disposal footprint (the survey area), utilising existing BCH data and hydrographic data to optimise the proposed survey design.

Overall, evaluation of transects surveyed in the present assessment recognised two habitat types, with five community types found within one or more of those habitats (Table A - 1 and Figure A - 2).

Table A - 1. Zone 5 Bypass Channel Project BCH types

Habitat Type	Community Type	Biota Present
Unconsolidated Sediment Sand (flat or rippled, medium to coarse grained) and gravel	Bare	Occasional macroalgae (including <5 m^2 patches of turf algal mats and filamentous algae), filter feeders (<2 % cover) and <2 m^2 patches of seagrass (<2 % cover)
	Sparse Invertebrates	2 to <10 % cover of invertebrates (sponges and other mixed filter feeders) growing in sand.
Low Relief (<1 m) Consolidated Hard Substrate Hard limestone pavement or rubble with or without a sand veneer	Sparse Invertebrates	2 to <10 % cover of invertebrates (sponges, soft corals, gorgonians and other mixed filter feeders) and occasional hard corals (<3% cover) growing on hard substrate surrounded by patches of bare sand.
	Low Density Invertebrates	10 to <20 % cover of invertebrates (soft corals, sponges, gorgonians and other mixed filter feeders) and hard corals (<5% cover) growing on hard substrate surrounded by patches of bare sand.
	Medium Density Invertebrates	20 to <40 % cover of invertebrates (sponges, soft corals and other mixed filter feeders) and hard corals (<10% cover) growing on hard substrate surrounded by patches of sand.
	Medium Density Mixed Communities	Mixed benthos up to 40% cover of turf algae, invertebrates (sponges, soft corals and other mixed filter feeders) and hard corals (10 to 20 % cover), growing on hard substrate surrounded by patches of sand.

Close to 94% of the survey area was mapped as bare sand (<2 % cover of biota). Sparse (2 to <10 % cover) to medium density (20 to <40 %) invertebrates (non-coral) growing on unconsolidated and hard consolidated substrate formed 4% of the area. Approximately 85 ha, or 2%, consisted of mixed community (up to 40% cover of sponges, soft corals and mixed filter feeders and up to 20% of hard coral cover) growing on isolated outcrops of hard substrate and the hard substrate ridgeline running parallel to the coastline in the north of the zone which appears to be an extension of Minilya Bank to the east of the Project area.

Within the areas proposed for capital dredging, Zone 5A(i) (18.9 ha) was mapped as bare unconsolidated sand habitat (<2 % biota cover), Zone 5A(ii) (6.6 ha) was mapped as mixed community (turf algae, sponges, soft corals and other mixed filter feeders and up to 20% cover of hard corals) growing on consolidated hard substrate, and Zone 5A(iii) (136.4 ha) was mapped as 99% bare unconsolidated sand habitat (<2 % biota cover) and 1% sparse (2 to <10 % cover) to low density (10 to 20 %) sessile invertebrates (non-coral) growing on either unconsolidated sediment or consolidated hard substrate.

The five community types identified are common elsewhere offshore of Port Hedland, as shown by habitat mapping for the BHP Outer Harbour Development (SKM 2009b). The present mapping presents the distribution of benthos at a single time. The habitats identified within this survey are known to change their density and distribution over time in response to natural disturbances and seasonal effects. In particular, seagrasses and macroalgae beds of the nearshore Pilbara are recorded as showing regular large seasonal changes in distribution and density.

There were no benthic habitats, communities or biota of regional significance identified in this survey of the Project area. Whilst community distributions may vary over time, this survey provides an accurate representation of the distribution of communities and habitats immediately prior to dredging and was used to inform this dredging management plan.

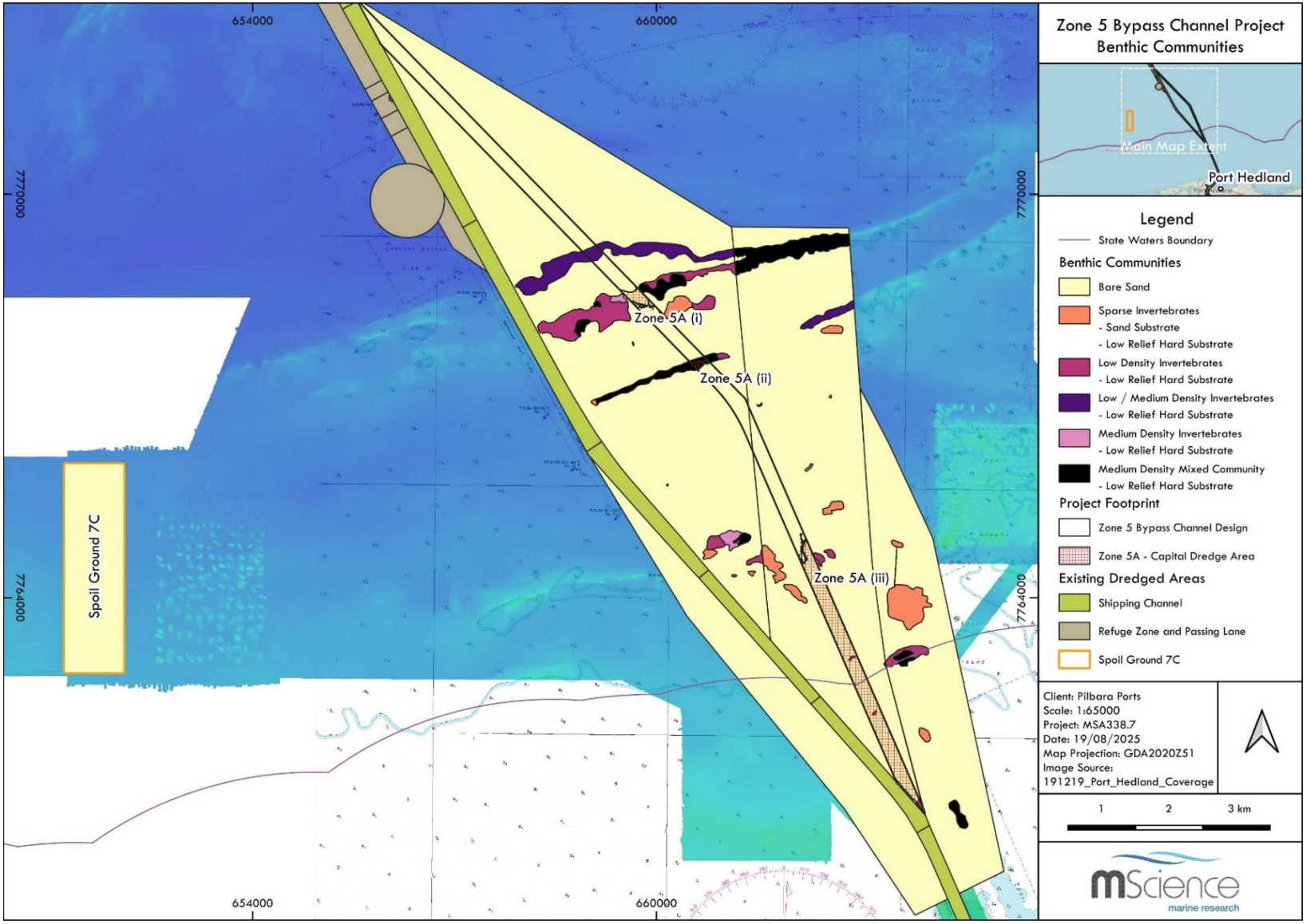

Figure A - 2. Zone 5 Bypass Channel benthic communities

MARINE FAUNA

The threatened and/or migratory species listed in Table A - 2 were considered to have a greater than 'possible' likelihood of being present within (1km) and/or adjacent (within 20km) to the proposed dredging footprint and spoil ground, based on the Commonwealth Protected Matters Search Tool (PMST) report (Appendix C) and likelihood of occurrence assessment outlined in Appendix B. The assessment of impacts to marine fauna from dredging activities provided in this document has been limited to those listed in Table A - 2.

Table A - 2. Threatened and/or migratory marine fauna with potential to occur within (1 km) or adjacent (20 km) to the dredging and disposal area

Species	**Likelihood of Occurrence ***	
	1 km	**20 km**
Seabirds		
Wedge-tailed Shearwater (*Ardenna pacifica)*	AC	AC
Lesser Frigatebird (*Fregata ariel)*	AC	AC
Little Tern (*Stemula albifrons)*	R	P
Shorebirds		
Red Knot (*Calidris canutus)*	U	L
Curlew Sandpiper (*Calidris ferruginea)*	U	L
Great Knot (*Calidris tenuirostris)*	R	L
Greater Sand Plover (*Charadrius leschenaultia)*	R	L
Lesser Sand Plover (*Charadrius mongolus)*	R	L
Far Eastern Curlew (*Numenius madagascariensis)*	U	L
Little Curlew (*Numenius minutus)*	R	P
Common Sandpiper (*Actitis hypoleucos)*	U	P
Marsh Sandpiper (*Tringa stagnatilis)*	R	P
Common Greenshank (*Tringa nebularia)*	R	L
Pacific Golden Plover (*Pluvialis fulva)*	R	L
Osprey (*Pandion haliaetus)*	U	L
Grey-tailed Tattler (*Tringa brevipes)*	R	L
Ruddy Turnstone (*Arenaria interpres)*	R	L
Sharp-tailed Sandpiper (*Calidris acuminata)*	U	L
Oriental Pratincole (*Glareola maldivarum)*	R	L
Broad-billed Sandpiper (*Limicola falcinellus)*	R	L

Species	Likelihood of Occurrence *	
	1 km	20 km
Asian Dowitcher (*Limnodromus semipalmatus)*	R	L
Black-tailed Godwit (*Limosa limosa)*	R	L
Whimbrel (*Numenius phaeopus)*	R	L
Sanderling (*Calidris alba)*	R	L
Terek Sandpiper (*Xenus cinereus)*	R	L
Oriental Plover (*Charadrius veredus)*	R	L
Grey Plover (*Pluvialis squatarola)*	R	L
Red-necked Stint (*Calidris ruficollis)*	R	L
Long-toed Stint (*Calidris subminuta)*	R	L
Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri)*	R	L
Bar-tailed Godwit (*Limosa lapponica)*	R	L
Wood Sandpiper (*Tringa glareola)*	R	P
Marine Mammals		
Humpback whale (*Megaptera novaeangliae)*	P	P
Killer whale (*Orcinus orca)*	P	P
Australian Humpback Dolphin (*Sousa sahulensis)*	P	P
Indian Ocean / Spotted Bottlenose Dolphin (*Tursiops aduncus)*	P	P
Australian Snubfin Dolphin (*Orcaella heinsohni)*	P	P
Dugong (*Dugong dugon)*	P	P
Marine Reptiles		
Loggerhead turtle (*Caretta caretta)*	L	L
Green turtle (*Chelonia mydas)*	L	L
Leatherback turtle (*Dermochelys coriacea)*	U	P
Hawksbill turtle (*Eretmochelys imbricata)*	L	L
Flatback turtle (*Natator depressus)*	L	AC
Elasmobranchs and other fish		
Narrow sawfish (*Anoxypristis cuspidate*)	U	P
Green sawfish (*Pristis zijsron)*	U	L
Dwarf Sawfish (*Pristis clavate)*	U	P
Grey nurse shark (*Carcharias taurus)*	U	P
Scalloped hammerhead shark (*Sphyrna lewini)*	U	P

Species	Likelihood of Occurrence *	
	1 km	20 km
Giant manta ray (*Mobula birostris*)	P	P
Reef manta ray (*Mobula alfredi*)	P	L

* R=Rare, U=Unlikely, P=Possible, L=Likely, AC=Almost Certain

The marine fauna listed in Table A - 2 have been discussed in the following sections.

Seabirds/Shorebirds

The Pilbara coast and islands, provide various habitats as important refuge for shorebirds and seabirds. Seabirds and shorebirds are more likely to be vulnerable to indirect impacts (e.g., light pollution or hydrocarbon spill leading to degradation of breeding/foraging areas), rather than direct impacts (habitat removal) from the Project. Three seabird species with a greater than 'possible' likelihood of being present within or adjacent to the Project development the wedge-tailed shearwater, lesser frigatebird and little tern are known to breed in locations close to the Port Hedland area (Table A - 3, Figure A - 3) (Higgins and Davies 1996; Johnstone et al. 2013).

Table A - 3. Seasonal presence of breeding seabirds in Port Hedland

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wedged-Tailed Shearwater	Breeding known									Breeding known		
Lesser Frigatebird					Breeding known							
Little Tern				Breeding known					Breeding known			

Wedged-Tailed Shearwater

The global population of the wedge-tailed shearwater is estimated to number >5,200,000 individuals. Australia hosts a large proportion of the global population with approximately 1.1 million pairs breeding in Western Australia (Commonwealth of Australia 2020). The species feeds mostly on fish, with some cephalopods and crustaceans. It catches prey mainly on the wing by dipping but also by surface-seizing or pursuit-plunging. Usually solitary or in small parties at sea, but often in large feeding flocks with other species (Commonwealth of Australia 2020).

The wedge-tailed shearwater is a common breeding visitor to the Pilbara coast, although colonies are concentrated on offshore islands located to the west of the Port Hedland area (Johnstone et al. 2013). The closest islands being those offshore from Balla Balla (Depuch Island, Sable Island, Ronsard Island) ~90km south-west of Port Hedland. As such, the area around these islands has been identified as a Biologically Important Area (BIA) for breeding and foraging (DCCEEW 2025).

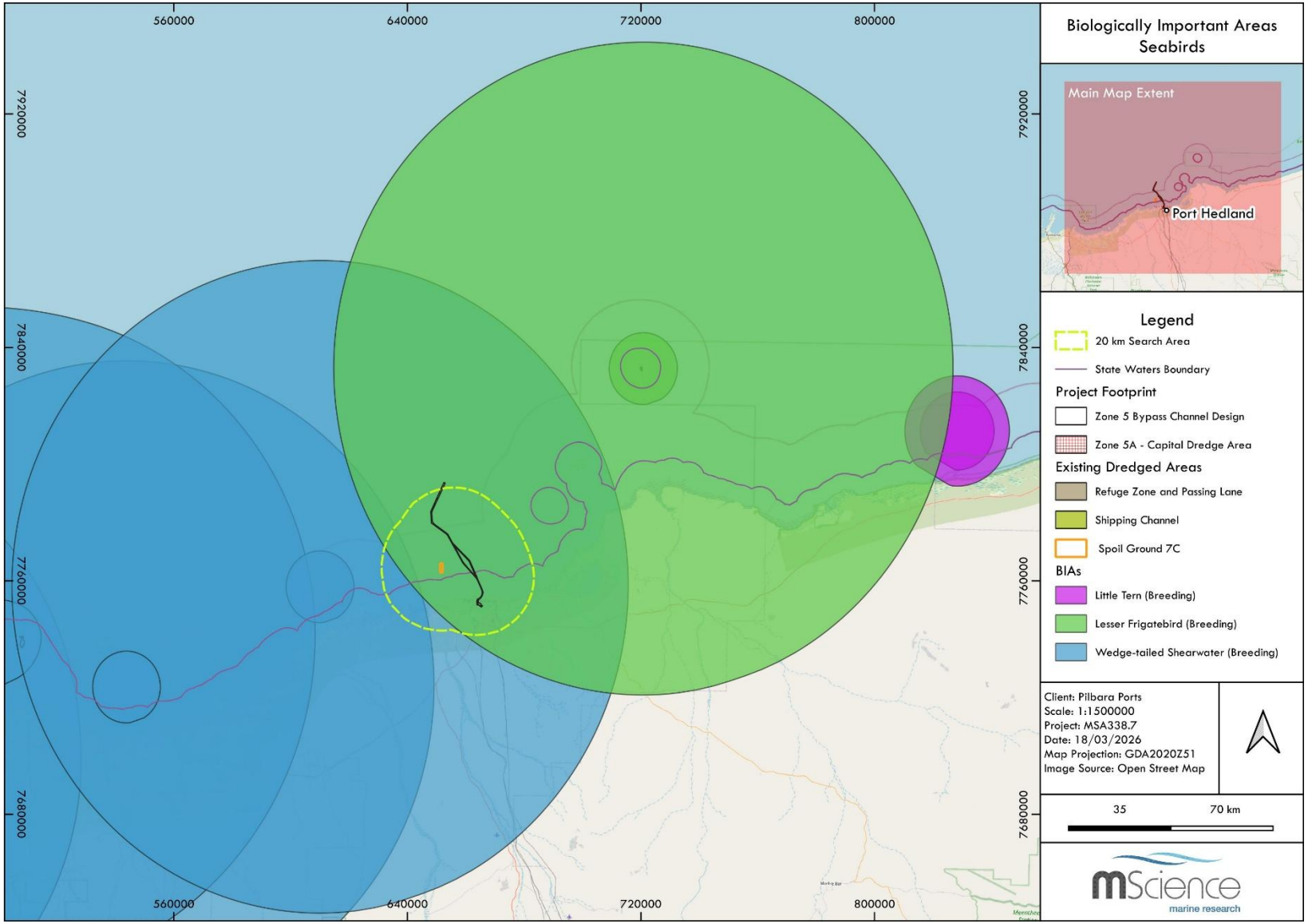

Figure A - 3. Biologically important areas for Project relevant seabirds

The wedge-tailed shearwater is listed as Migratory under the EPBC Act BC Act. Australia has no adopted or made recovery plan for the species. However, the wedge-tailed shearwater is covered under the Australian wildlife conservation plan for seabirds (Commonwealth of Australia 2020).

It is possible that during breeding, adults will forage in the waters adjacent to the Project development, as indicated by the overlap of a BIA. However, due to low abundance of prey species, large numbers are not expected. Individuals may pass through the area enroute to more optimal foraging areas.

Lesser FrigateBird

The global population of the lesser frigatebird is widespread across tropical and subtropical regions of the Indian and Pacific Oceans. In Australia, the species breeds on several offshore islands along the Pilbara and Kimberley coasts. Lesser frigatebirds feed primarily on fish and squid, catching prey on the wing or by kleptoparasitism from other seabirds (Commonwealth of Australia 2020). Usually seen singly or in small groups, they occasionally form larger feeding aggregations with other seabird species.

The lesser frigatebird is a breeding visitor to the Pilbara, with a major colony located on Bedout Island, approximately 90 km northeast of the Project footprint. Bedout Island is recognised as an Important Bird and Biodiversity Area (IBA) as it is home to 1% of the world's population of lesser frigatebirds, supporting over 2,000 breeding pairs prior to Cyclone Ilsa in 2023 which impacted 80–90% of all individual birds nesting on the island (Lavers et al. 2024).

The species is listed as Migratory under the EPBC Act. While there is no dedicated recovery plan, lesser frigatebird populations are covered under regional seabird conservation frameworks. BIAs have been mapped for the species, including breeding and foraging around Bedout Island (DCCEEW 2025).

It is possible that during breeding, adults will forage in the waters adjacent to the Project development. However, the reduction in adult numbers caused by Cyclone Ilsa in 2023 may temporarily reduce the frequency of use of these waters, with recovery expected over subsequent years.

Little Tern

The global population of the little tern is estimated to number 190,000–410,000 individuals (Commonwealth of Australia 2020). It is estimated that there are 3,000 breeding birds in the Australian breeding population (DCCEEW 2021). The species breeds on barren or sparsely vegetated beaches, islands and spits or in estuaries, saltmarshes, saltpans, offshore coral reefs, rivers, lakes and reservoirs. Its diet consists predominantly of small fish and crustaceans 3-6 cm long as well as insects, annelid worms and molluscs. At Port Hedland Saltworks the population is typically 20–30 birds and is essentially resident over Sept.–April (Johnstone et al. 2013).

There are at least two separate populations of the little tern in Australia: a non-breeding population from Asia and an Australian breeding population (DCCEEW 2021). The northern breeding population is very poorly known. Some sources have said that it breeds at different times of year than the south-eastern population, but recent information is showing a more complex breeding pattern for the northern population. It has been noted breeding nearly all year, but tending to two main periods: one between late April and July; another between September and early January.

The species is listed as Migratory under the EPBC Act. BIAs have been mapped for the species, the closest to the Project being an area for breeding at Eighty Mile Beach ~200 km east of Port Hedland (DCCEEW 2025). It is possible that during breeding, adults nesting at the Port Hedland Saltworks will forage in the

waters adjacent to the Project development. However, large numbers are not expected due to the lack of suitable foraging habitat.

ShoreBirds

Australia is situated within the East Asian–Australian Flyway, a geographic region supporting populations of migratory shorebirds throughout their annual cycle (Bamford et al. 2008). Although exact timing varies between species, an approximate annual cycle for shorebirds in the EEA Flyway has been identified as: breeding (May to August); southward migration (August to November); non-breeding (December to February); and northward migration (March to May).

All the shorebirds identified in Table A - 2 are non-breeding visitors to Australia and are unlikely to be found within the offshore area proposed for dredging. During the non-breeding period in Australia, these migratory shorebirds are typically found in coastal and inland habitats where adult birds build up the energy reserves necessary to support northward migration and subsequent breeding (Bamford et al. 2008).

The distribution and abundance of migratory shorebirds in the Port Hedland area has been reported previously for the BHP Outer Harbour Development (Bennelongia 2011) and Spoilbank Marina Project (Bamford Consulting 2019). Those studies concluded sediment (sand and mud) flats on open shorelines, particularly between Pretty Pool and Six Mile Creek, provided the most valuable shorebird foraging habitat in the area.

Bamford et al. (2008) estimated numbers of migratory waterbird species in the Gascoyne/Pilbara area. The numbers reported from the Port Hedland studies are insignificant in comparison, in most cases. Species with around 10% or greater of the estimated number in the Pilbara/Gascoyne recorded around Port Hedland include: Bar-tailed Godwit (9.0%), Whimbrel (10.6%), Grey-tailed Tattler (11.8%), Sanderling (73.0%) and Greater Sand-Plover (15.2%). Of these, the Sanderling is of note as the Port Hedland region number is close to the 1% criterion for the species in the entire East Asian/Australasian Flyway (Bamford et al. 2008).

The shorebirds identified in Table A - 2 are unlikely to be found within the Project development due to its offshore location. Individuals may pass through the area enroute to more optimal foraging areas.

Marine Mammals

The marine and coastal environment offshore of Port Hedland includes a unique combination of inshore reef and seagrass habitats and deeper water within channels between offshore islands, providing diversity in habitats able to support a variety of marine mammal species, including whales, dolphins and dugong.

Humpback Whale

The Project area is within a BIA for migration of the species. Humpback whales migrate from feeding grounds in the Antarctic to breeding grounds in Camden Sound in the Kimberley region of Western Australia. A population of 33,000 humpback whales are known to make this migration annually (Salgado Kent et al. 2012). The north bound migration peaks adjacent to the Port Hedland area between approximately late July and early August. The peak of the south bound migration occurs during late August and mid-October (Table A - 4, Figure A - 4).

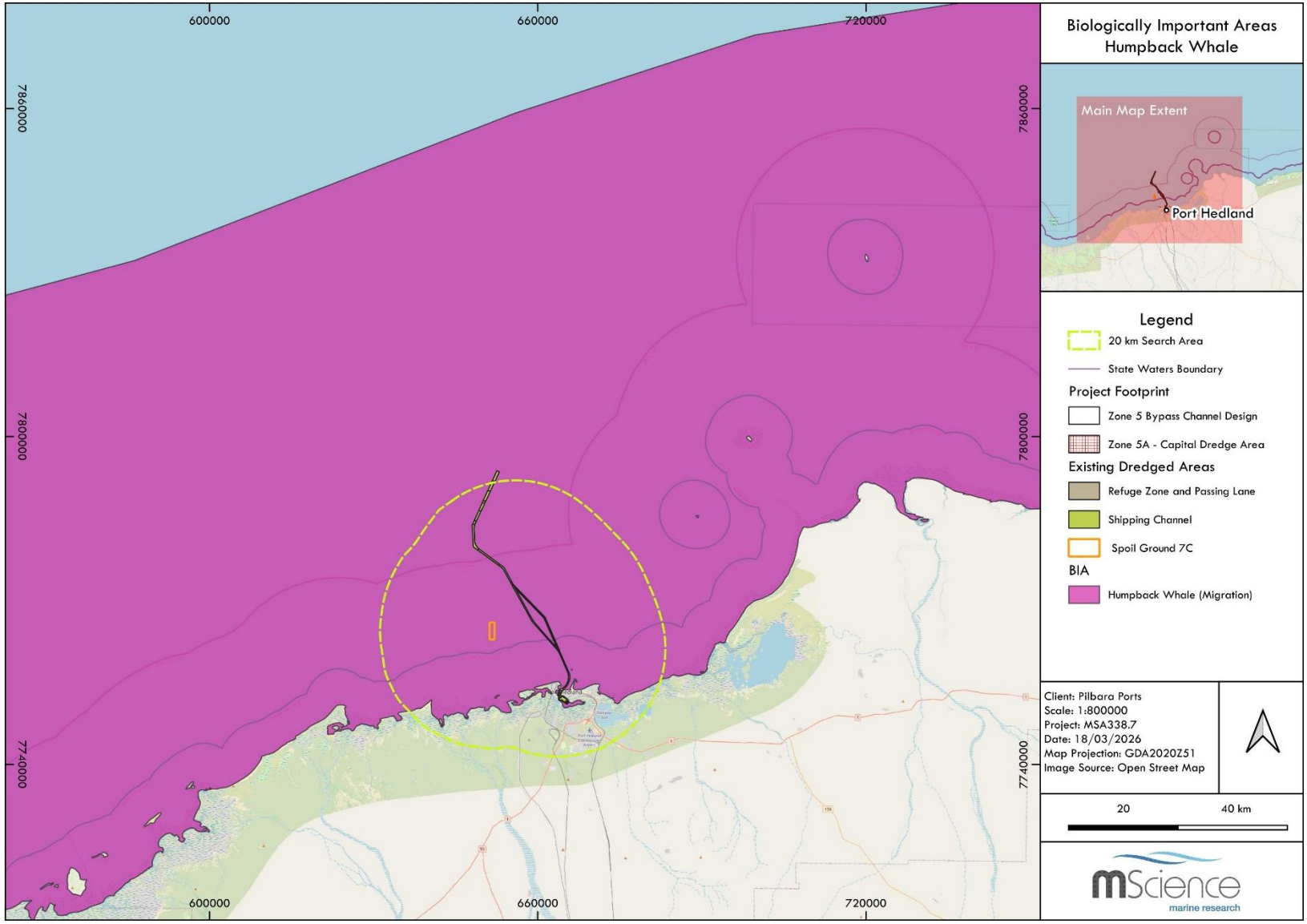

Figure A - 4. Biologically important area for the humpback whale relevant to the Project

Jenner et al. (2001) suggested that the majority of migrating whales are found in waters deeper than 50 m; however, some individuals come closer to shore, particularly during the southern migration.

Table A - 4. Peak (dark grey) migration periods for humpback whales in the Port Hedland area

Species	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Humpback Whale	Northern Migration												
	Southern Migration												

The Port Hedland region is not a known feeding, aggregation or major calving area for this species (Jenner and Jenner 2009; Jenner and Jenner 2011).

Humpback whales are listed as Migratory under the EPBC Act and as Conservation Dependant fauna under the BC Act. Their global (non-statutory) listing by the IUCN is Least Concern. There is no current Recovery Plan for the species.

The greatest threats to humpback whales in WA are vessel strike, entanglement in marine debris and human-made underwater noise, in particular, high decibel impulsive sound sources such as pile driving (resulting in hearing impairment, organ damage, communication interference, elevated stress levels and/or avoidance of important habitat).

Humpback whales have been recorded within Port Hedland, and the area is listed as a BIA for migration of the species. As such, whales may be present in the outer Port Hedland harbour and Spoil Ground 7C during the known migrations.

Killer whale

The killer whale has a widespread distribution from polar to equatorial regions of all oceans and has been recorded in waters off all states of Australia (Bannister et al. 1996). Killer whales appear to be more common in cold, deep waters; however, they have been observed along the continental slope and shelf of northwestern Australia (Bannister et al. 1996), as well as offshore of Port Hedland (ABC News 2024)

The species distribution and occurrence in Australia strongly reflect locations of prey aggregation, particularly breeding and feeding grounds (Morrice 2004), such as those of the humpback whale (Pitman et al. 2015).

The killer whale is listed as Migratory under both the EPBC Act and BC Act. Australia has no adopted or made recovery plan for the species.

Given the wide distribution of killer whales and their preference for colder, deeper waters, individuals are unlikely to occur in waters adjacent to the proposed dredging area.

Australian humpback dolphin

Australian humpback dolphins are limited to the shallow (< 30 m deep) tropical/subtropical coastal waters of the Sahul shelf of northern Australia and the southern waters of Papua New Guinea (Allen et al. 2012). In the north-west of Australia, the species has been recorded between Coral Bay and Roebuck Bay (Allen et al. 2012). However, there is a paucity of studies into distribution of the Australian humpback dolphin in the region or across WA more broadly. In the Pilbara, the species has been recorded up to 50 km from the

mainland, however this finding was possibly associated with the location of offshore islands (Hanf et al. 2022).

The Australian humpback dolphin is listed as Migratory under the EPBC Act and Priority 4 under the BC Act. Australia has no adopted or made recovery plan for the species.

In addition to potential direct impact from vessel strike, humpback dolphins are at high risk from sub-lethal effects of habitat disturbance due to their high site fidelity and small, discrete populations that spatially overlap with human activity (i.e., coastal development; petroleum exploration; commercial fishing; recreational boating) (Allen et al. 2012). Underwater noise has the potential to cause direct harm, or effect hearing through masking and hinder communication ability which is important for maintain social structure and natural behaviours.

The waters within and adjacent to the dredging area and spoil grounds are consistent with habitats of known presence, and therefore, individuals may traverse the area.

Indian Ocean / Spotted Bottlenose Dolphin

Indian-Ocean bottlenose dolphins occur in tropical and sub-tropical, shallow waters from South Africa to the Red Sea and eastwards to the Arabian Gulf, India, China and Japan, southwards to Indonesia and New Guinea, and New Caledonia. Within Australia the species is restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters, around the whole Australian coast (Allen et al. 2012).

Prince (2001) undertook aerial surveys of marine mammals and other large fauna of the Pilbara coast and concluded that Pilbara coastal waters support small populations of dolphins, the majority of which appear to be bottlenose. Frequent sightings of Indian Ocean bottlenose dolphins in the waters of Port Hedland are reported in Allen et al. (2012).

Indian Ocean bottlenose dolphins are listed as Migratory under both the EPBC Act and BC Act. There is no adopted or made recovery plan for the species in Australia.

Like the humpback dolphin, bottlenose dolphins are also susceptible to vessel strike, habitat disturbance and underwater noise.

Given the known sightings of this species, Indian Ocean bottlenose dolphins may occur in waters adjacent to the dredging area and spoil grounds.

Australian Snubfin Dolphin

Australian Snubfin dolphins are found in the North-west Marine Region in nearshore state waters along the coast from Cape Londonderry south to Roebuck Bay, with records of vagrants as far south as Exmouth Gulf. They have been recorded within the Dampier Archipelago, Port Hedland, Cable Beach and Roebuck Bay from the Montebello Islands, Exmouth Gulf and the North West Cape (Allen et al. 2012).

Australian Snubfin Dolphins share similar habitat preferences with Australian humpback dolphins. Feeding may occur in a variety of habitats, from mangroves to sandy bottom estuaries and embayments, to rock and/or coral reefs. Feeding primarily occurs in shallow waters (less than 20 m) close to river mouths and creeks.

The Australian snubfin dolphin is listed as Migratory under the EPBC Act and Priority 4 under the BC Act. Australia has no adopted or made recovery plan for the species.

The Australian snubfin dolphin could potentially be impacted by vessel strike, habitat disturbance and underwater noise.

The waters within and adjacent to the dredging area and spoil grounds are consistent with habitats of known presence, and therefore, individuals may traverse the area.

Dugong

Dugongs are usually found in large numbers only in shallow waters supporting extensive seagrass meadows. The species has been sighted near Little Turtle Island offshore of Port Hedland, although the observers could not determine if the animals were feeding, resting or traveling (SKM 2011).

Dugong distributions are known to be directed towards seagrass beds, and there are no extensive seagrass meadows within or adjacent to the Project development envelope (MScience 2025; SKM 2009b). The Dugong's reproductive cycle is sensitive to food availability; breeding is delayed if sufficient food is not available.

Dugongs are listed as Migratory under the EPBC Act and as Other Protected Fauna under the BC Act. Their global (non-statutory) listing by the IUCN is Near Threatened. Dugongs are species of high cultural and conservation significance in Australia and many other coastal regions globally. Australia has no adopted or made recovery plan for dugongs.

Vessel strike, habitat loss and habitat degradation have been identified as key threatening processes for dugongs.

Due to the absence of seagrass habitat in waters within or adjacent to the dredging area and spoil grounds, dugongs are highly unlikely to occur regularly or in large numbers adjacent to the dredging area or spoil grounds. Individuals may infrequently transit between suitable foraging habitats.

Marine Reptiles

Five threatened and/or migratory turtle species have been identified as potentially occurring within and/or adjacent to the dredging area and spoil grounds; Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*), Flatback (*Natator depressus*), Loggerhead (*Caretta caretta*) and Leatherback Turtle (*Dermochelys coriacea*). Knowledge of loggerhead turtle populations within the Port Hedland area is sparse. Leatherback turtles are occasional visitors to Western Australian waters and have not been documented nesting. The green and hawksbill turtle are known to commonly nest on beaches in the Pilbara Region, but only the flatback turtle is known to nest in the Port Hedland area (Table A - 5, Figure A - 5) (Commonwealth of Australia 2017; Pendoley 2005; Prince 1993).

Marine turtles have high nesting beach fidelity, returning to the same beach from where they were born to lay their eggs. Nesting sites are selected carefully as nests can be disrupted by flooding or erosion (as well as feral animals such as cats and foxes). After a period of incubation (in which time sand temperature will influence the male-female sex ratio), hatchlings will emerge and head to the open ocean using natural navigation cues. It is at this time where turtles are at their most vulnerable, with high levels of predation by native (e.g., seabirds, goannas, sharks) and introduced (e.g., cats, foxes) animals. Should they become disorientated, their path to the ocean will become less direct, which increases predation risk, or they may not be able to find the ocean at all. Many aspects of the post-hatchling period are unknown.

Key threats to marine turtles are light pollution (i.e., disturbance to nesting behaviour and misorientation of turtle hatchlings), direct habitat removal, degradation of nesting and foraging areas, vessel strike, underwater noise and entrainment from dredgers.

Table A - 5. Peak (dark grey) activity of foraging, nesting/inter-nesting female turtles and emerging hatchlings of relevant species in the Pilbara

Species	Activity	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Green Turtle	Nesting/Inter-nesting												
	Emergence												
	Foraging												
Hawksbill Turtle	Nesting/Inter-nesting												
	Emergence												
	Foraging												
Flatback Turtle	Nesting/Inter-nesting												
	Emergence												
	Foraging												

Flatback Turtle

Mundabullangana, located approximately 50 km west of Port Hedland, supports a regionally important flatback turtle rookery. This population is considered one of the largest nesting flatback turtle populations in the world (Pendoley 2009). Eighty Mile Beach, approximately 280 km north-east of Port Hedland Harbour, is thought to support a similar size nesting population to Mundabullangana. Flatback turtle nesting has been recorded across a number of mainland beaches and offshore islands within the Port Hedland area. These nesting beaches, and inter-nesting buffer, are designated BIAs (Figure A - 5). A low to moderate density of nesting has been recorded at Cemetery Beach, Paradise Beach, Pretty Pool and Cooke Point, whilst a very low density of nesting has been recorded at Downes Island (Pendoley 2009). None of these rockeries are considered regionally significant when compared with the rockery at Mundabullangana. Nesting at Cemetery Beach typically occurs between October and February, peaking between November and January with hatchling emergence occurring between December and March (Table A - 5) (Pendoley 2019). Inter-nesting activities are likely to occur during the same period of nesting.

Concentrations of resident foraging turtles have been found to be generally located around the offshore islands, including North and Little Turtle Islands, in creek mouths, over shallow intertidal platforms and out from the De Grey River mouth. North Turtle Island is considered to be a biologically important foraging area for the species (Pendoley 2005).

Knowledge of the inter-nesting movements of flatback turtles within the Port Hedland area is provided by satellite tracking of 16 individuals nesting at Cemetery Beach (Pendoley 2009). During inter-nesting, some individuals remained relatively close (within 10 km) to the nesting beach in shallow coastal waters (<3 m depth), whilst others were observed to travel over 50 km from the nesting beach. The principal inter-

nesting habitat utilised by flatback turtles nesting at Cemetery Beach was to the north and northeast of the nesting beach.

Flatback turtles are listed as Vulnerable and Migratory under the EPBC Act and BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017).

Inter-nesting and foraging adult flatback turtles may occur in the waters within and adjacent to the dredging footprint; however, large numbers are not expected, given the lack of significant foraging habitat within the dredge footprint and known movements of inter-nesting turtles to the northeast of Cemetery Beach, away from the Proposal footprint.

Green Turtle

Very little green turtle nesting has been recorded within the Port Hedland area (Pendoley 2009).

The intertidal platform at North Turtle Island is considered to be a significant foraging habitat for green turtles. As such, the North Turtle/Little Turtle islands and De Grey River area is a designated BIA for this behaviour (Figure A - 5). Other foraging habitats include Weerdee Island, in creek mouths, over shallow intertidal platforms and within the Inner Harbour of the port.

Green turtles are listed as Vulnerable and Migratory under the EPBC Act and BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017).

Foraging and migrating green turtles may occur in the waters adjacent to the dredging and disposal areas; however, large numbers are not expected given the lack of significant foraging habitat and based on understanding of known migration routes (usually offshore in depth of 12 to 80 m).

Hawksbill Turtle

Very little hawksbill turtle nesting has been recorded within the Port Hedland area (Pendoley 2009).

Hawksbill turtles are found within rock and reef habitats, coastal areas and ponds. They are known to forage amongst vertical underwater cliffs, on coral reefs and on gorgonian (soft coral) flats, as well as seagrass or algae meadows (Limpus 2009a). The species has been recorded from satellite transmitters as spending time in the vicinity of North Turtle Island, given the presence of sponges for foraging. As such, the North Turtle/Little Turtle islands and De Grey River area is a designated BIA for foraging for the species (Figure A - 5).

Hawksbill turtles are listed as Vulnerable and Migratory under the EPBC Act and BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017).

Foraging and migrating hawksbill turtles may occur in the waters adjacent to the dredging footprint; however, large numbers are not expected, given the lack of significant foraging habitat and our understanding of known migration routes (usually offshore in depth of 12 to 80 m).

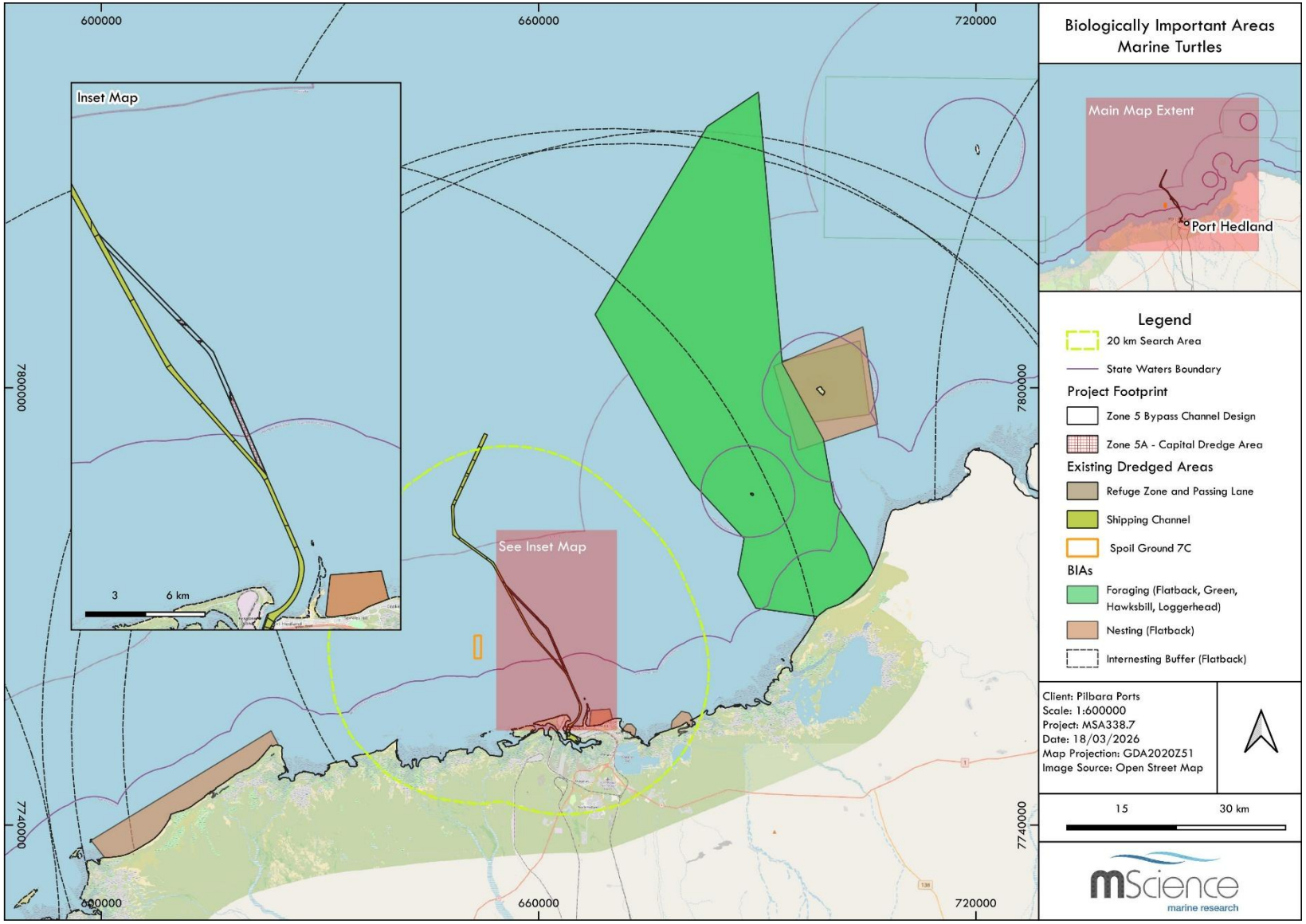

Figure A - 5. Biologically important areas for Project relevant marine turtle species

Loggerhead Turtle

Knowledge of loggerhead turtle populations at Port Hedland is sparse, and no loggerhead turtle nesting has been recorded within the Port Hedland area (Pendoley 2009).

The Western Australian loggerhead turtle stock is one of the largest in the world and is distributed from the Gascoyne (Dirk Hartog Island) to Pilbara (Varanus Island) Regions (Commonwealth of Australia 2017). Loggerhead turtles are a nearshore species which prefer warm, shallow continental shelves and coastal bays and estuaries (Limpus 2008). The species feed in a wide range of tidal and subtidal habitats including coral and rocky reefs, seagrass meadows, and soft-bottomed sand or mud areas. The North Turtle/Little Turtle islands and De Grey River area is a designated BIA for foraging for the species (Figure A - 5).

Loggerhead turtles are listed as Endangered and Migratory under the EPBC Act the BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017).

Foraging and migrating loggerhead turtles may occur in the waters adjacent to the dredging footprint. However, significant numbers are not expected, given the sparsity of optimal foraging habitat.

Leatherback Turtle

No major leatherback turtle rookeries are known to occur in Western Australia, with scattered nesting reported in Queensland only (Limpus 2009b; Prince 2001). Leatherback Turtle diet is dominated by gelatinous organisms such as jellyfish, salps, squid and siphonophores, which influences their distribution, both in the open ocean and close to shore (Limpus 2009b).

Leatherback turtles are listed as Endangered and Migratory under the EPBC Act the BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017).

It is possible transient leatherback turtles may pass through waters offshore of Port Hedland, but due to lack of significant food sources, individuals are not expected within the proposed dredging area.

Elasmobranchs and Other Fish

Listed threatened and/or migratory elasmobranch species with the potential to occur within and/or adjacent to the dredging and disposal areas include the grey nurse shark (*Carcharias taurus*), scalloped hammerhead shark (*Sphyrna lewini*), giant manta ray (*Mobula birostris*) and reef manta ray (*Manta alfredi*). The PMST also identified two threatened (listed as Vulnerable) sawfish species: the green sawfish (*Pristis zijsron*) and dwarf sawfish (*P. clavate*), and the Migratory narrow sawfish.

Sawfish

The known distribution of sawfish species in north-western Australia has been based on targeted sampling or discovery/donation of sawfish rostrum (Morgan et al. 2011). The closest targeted sawfish surveys to the Project development have occurred at Onslow (Morgan et al. 2015; Morgan et al. 2017). Nursery sites for newborn sawfish pups are generally found in shallow, nearshore habitats often in close proximity to river mouths (Morgan et al. 2011). The dredging area is not located close to a river mouth. Of the three species of sawfish identified as having the potential of occurring in proximity to the dredging area only the green sawfish has been confirmed through sightings in the Port Hedland area (Morgan et al. 2019; Morgan et al. 2011).

The known distribution of the green sawfish is from the Whitsundays in Queensland across northern Australian waters to Shark Bay in WA. They are known to primarily occur in inshore and offshore marine waters, or in shallow estuarine waters, however, the species does not inhabit freshwater. Green sawfish generally have a very small home range, occupy very shallow waters and are likely to avoid areas of high vessel traffic, such as Pilbara Ports facilities (Morgan et al. 2017).

The dwarf sawfish usually inhabits shallow (2–3 m) coastal waters and estuarine habitats, often influenced by large tides. Estuarine habitats are used as nursery areas by dwarf sawfish, with immature juveniles remaining in these areas up until three years of age. The majority of capture locations and donated rostra in Western Australia have been between King Sound and Cape Keraudren (Morgan et al. 2011).

In Australia, the Narrow Sawfish is found across northern Australia from the Pilbara Coast in WA to Broad Sound (Queensland). It is a bentho-pelagic species that inhabits coastal and estuarine habitats. It occurs to depths of at least 40 m (Last and Stevens 2009). Adults mainly occur offshore while juveniles and pupping females require inshore and estuarine habitats.

Research and commentary provided by Dr David Morgan (Harry Butler Institute) to support the Port Hedland Spoilbank Marina Project have stated that sawfish have a home range of approximately 400 km. A collation of recent records occurring after 2010 of sawfish recorded or caught between 80 Mile Beach and south to Karratha, totalled 66 sightings, with16 located at Port Hedland (Morgan et al. 2019).

Green, dwarf and narrow sawfish are all listed as Vulnerable and Migratory and marine under the EPBC Act. Under the BC Act, green sawfish is listed as Vulnerable and dwarf sawfish are Priority 1. At the international level dwarf sawfish are listed as Endangered and green Critically Endangered. Their conservation is managed under the Sawfish and River Sharks Multispecies Recovery Plan (DoE 2015).

Globally, overfishing and habitat alteration have caused major declines in sawfish populations. In relation to coastal development, key threats to sawfish include habitat degradation from changes to coastal processes and reduction in water quality (DoE 2015).

Considering the home range of sawfish, their preference for shallow coastal waters and the availability of these suitable habitats along the Pilbara coast, it is considered that sawfish are unlikely to be present in waters within the proposed dredging area.

Sharks and Rays

The grey nurse shark (west coast population) has a broad inshore distribution, primarily in sub-tropical to cool temperate waters, and is predominantly found in the south-west coastal waters of Western Australia (Last and Stevens 2009). The species is listed as Vulnerable under both the EPBC Act and BC Act. Australia has no adopted or made recovery plan for grey nurse sharks. The species tend to be found in groups at specific aggregation sites around inshore rocky reefs or islands (Otway et al. 2003). The grey nurse shark has been recorded along the North West Shelf, but their distribution in Western Australia is largely confined to the south-west coastal waters (Commonwealth of Australia 2014) and there are no known aggregation sites in Western Australia (Chidlow et al. 2005).

The scalloped hammerhead was given a Conservation Dependent listing under the EPBC Act by the threatened species scientific committee (TSSC) in 2018 (TSSC 2018). They are mobile animals that range widely over shallow coastal shelf waters. The species has a circum-global distribution in tropical and sub-tropical waters that shows strong genetic population structuring across ocean basins as it rarely ventures into or across deep ocean waters (TSSC 2018). The scalloped hammerhead is known to form large

migratory schools and in Australia tend to move south during the warmer months. Adults inhabit waters adjacent to continental shelves, in water depths ranging from the surface to at least 275 m in depth, while juveniles are found close to shore in nursery habitats. Adult females are thought to occupy deeper water and move into shallower waters to mate and give birth (TSSC 2018).

Both the reef manta ray and giant manta ray are listed as Migratory under the EPBC Act and BC Act. There is no adopted or made recovery plan for either species in Australia. The reef manta ray is commonly sighted on the continental shelf, around tropical and subtropical coral and rocky reefs, islands and along coastlines, preferentially occupying shallow depths < 20 m (Armstrong et al. 2020). Reef manta rays are capable of long-distance dispersal when habitat is continuous but also display a high degree of site fidelity. The giant manta ray has a circumglobal distribution and is considered an oceanic species found predominantly in cooler, temperate to subtropical waters (Last and Stevens 2009).

The waters within and adjacent to the Project development are consistent with habitats of known presence for the reef manta ray and juvenile scalloped hammerhead sharks, and therefore, individuals of these species may traverse the area but are likely to avoid areas of high vessel traffic, such as Pilbara Ports facilities.

Other Fish

Thirty-one fish species from the family *Sygnathidae*, listed as other protected matters under the EPBC Act, have been identified as potentially occurring within the PMST area.

Fish species of the Port Hedland region have not been well surveyed although they are expected to include a sub-set of the fish recorded at the Dampier Archipelago, approximately 250 km to the west.

Hutchins (2004) studied the shallow-water fish fauna of the Dampier Archipelago (to a depth of 30 m) and found it comprised a total of 650 species and featured a prominent component of coral reef species (465) and to a lesser extent mangrove species (116), soft bottom inhabitants (106 species) and a relatively low number of pelagic species (67). Larger species that attract divers and recreational and commercial fishers include coral trout (*Plectropomus spp*.), tusk fish (*Cheorodon spp*.), rock cod, large potato cods (*Epinephelus tukula*) and manta rays (*Manta birostris*). Although this survey was biased towards reef fishes, the survey also considered soft bottom and mangrove habitats as well as the pelagic environment. Hutchins found that species diversity was highest in areas of high topographic diversity, particularly along the northern perimeter of the archipelago. By comparison, the topography of the Port Hedland region consists of relatively low relief limestone ridgeline formations that support only sparse hard coral habitat, and consequently is expected to also support a less diverse suite of fish species.

Due to the lack of complex benthic habitats in waters adjacent to the dredging area, neither high abundance nor diversity of fish species are expected.

INTRODUCED MARINE SPECIES

In 1998, the CSIRO's Centre for Research on Introduced Marine Pests (CRIMP) conducted an introduced marine organism survey in the Port of Port Hedland and its adjacent coastline. The survey identified six introduced or cryptogenic biofouling species. Huisman *et al* (2008) later reported on the status of Introduced Marine Species (IMS) in Western Australian waters and identified 13 as occurring in Port Hedland, ten of which were additional to the CRIMPs survey. Pilbara Ports (2010) conducted a small scale biofouling study within SW Creek, which added a further six species to the list of IMS in Port Hedland. More recently, Wells (2018) undertook a detailed literature search of marine biodiversity studies in the Pilbara and developed a database of 5,532 species that have been recorded by previous surveys of IMS in the Pilbara, including within the Port of Port Hedland.

No studies or anecdotal data are available showing evidence that introduced crustaceans in the Port Hedland area have caused any ecological consequences, such as adverse impacts on native species. The only IMS known to have established a self-sustaining population is the tunicate *Didemnum perlucidum* (Wells 2018). First reported in Perth, WA, in 2010, *D. perlucidum* has since been well documented to have spread across the Western Australian coastline (Bridgwood et al. 2014). Due to its established populations and widespread distribution, DPIRD has determined that eradication of this species from Australian waters is now unlikely.

For the purposes of identifying introduced marine species, the Port of Port Hedland is part of the Western Australian State-Wide Array Surveillance Program (SWASP) that has been operating in Western Australian Ports since August 2016. The SWASP is a collaborative effort between all the WA Port Authorities and the DPIRDs Aquatic Biosecurity section. *D. perlucidum* is the only introduced marine species that has been detected during monitoring conducted for the SWASP in the Port of Port Hedland.

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APPENDIX B – SIGNIFICANT MARINE FAUNA LIKELIHOOD OF OCCURRENCE ASSESSMENT

EPBC Act 1999 Key			
Status		Presence Rank	
CE	Critically Endangered	**M**	May Occur
E	Endangered	**L**	Likely to Occur
V	Vulnerable	**K**	Known to Occur
MI	Migratory	**B - C**	Breeding – Congregation
CD	Conservation Dependent	**SH**	Species or Species Habitat

BC Act 2016 Key			
EX	Presumed Extinct	**OS**	Other Specially Protected
CR	Critically Endangered	**P1**	Priority 1
EN	Endangered	**P2**	Priority 2
VU	Vulnerable	**P3**	Priority 3
IA	Migratory birds protected under international agreement	**P4**	Priority 4
CD	Conservation Dependent		

Likelihood	Definition
Rare (R)	The species has not been recorded within the defined search area. No suitable habitat is present within the defined search area.
Unlikely (U)	The species has not been recorded within the defined search area. The current known distribution of the species does not overlap the defined search area, however, there is low presence of low value suitable habitat i.e. not suitable for either breeding, foraging, resting and/or migration.
Possible (P)	The species has not been recorded within the defined search area. However, the species preferred habitat is known to occur within the defined search area and is of moderate value i.e. disturbed breeding conditions, constrained foraging, resting and/or migration habitat OR The species has been recorded within the defined search area. However, there is low presence of low value suitable habitat i.e. not suitable for either breeding, foraging, resting and/or migration.
Likely (L)	The species has been recorded within the defined search area. The species preferred habitat is known to occur within the defined search area and is of moderate value i.e. disturbed breeding conditions, constrained foraging, resting and/or migration habitat
Almost Certain (AC)	The species has been frequently recorded within the defined search area. The species preferred habitat is known to occur within the defined search area and is of high value i.e. important breeding, foraging, resting and/or migration habitat.

*Preferred habitat / description sourced from DCCEEW Species Profile and Threats (SPRAT) Database (DCCEEW 2023) unless otherwise denoted

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Seabirds						
Southern Giant-Petrel *Macronectes giganteus*	E, MI	SH - M	IA	The Southern Giant-Petrel is a marine bird that occurs in Antarctic to subtropical waters. In summer it mainly occurs over Antarctic waters.	**Unlikely** - May fly through and/or forage within the area, but large numbers not expected.	**Unlikely** - May fly through and/or forage within the area, but large numbers not expected.
Common Noddy *Anous stolidus*	MI	SH - M	IA	In Australia, the Common Noddy occurs mainly in the ocean off the Queensland coast. During the breeding season, the Common Noddy usually nests on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. When not at the nest, individuals will remain close to the nest, foraging in the surrounding waters. Birds may nest in bushes, saltbush, or other low vegetation. During the non-breeding period, the species occurs in groups throughout the pelagic zone.	**Unlikely** - Not known to breed in the area. May fly over but the area is not expected to represent significant foraging habitat.	**Unlikely** – May fly through and/or forage but not known to breed in the area.
Fork-tailed Swift *Apus pacificus*	MI	SH - L	IA	The Fork-tailed Swift is almost exclusively aerial and is not known to breed in Australia. They are seen in inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. *Apus pacificus subsp. pacificus* is the only subspecies to migrate to Australia.	**Unlikely** - May fly over the area but unlikely to land	**Unlikely** - May fly over the area but unlikely to land
Wedge-tailed Shearwater *Ardenna pacifica*	MI	B - K	MI	The Wedge-tailed Shearwater is a pelagic, marine bird known from tropical and subtropical waters. The species breeds throughout its known range, mainly on vegetated islands, atolls	**Almost Certain** – Expected to occur during breeding	**Almost Certain** – Expected to occur during breeding

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				and cays. In the north west of Australia the Wedge-tailed Shearwater breeds in October/November. The species is known to breed on several islands west of the Project area.	season, given known breeding on islands and overlapping designated foraging BIA	season, given known breeding on islands and overlapping designated foraging BIA
Streaked Shearwater *Calonectris leucomelas*	MI	SH - L	-	The Streaked Shearwater breeds on islands off Japan, Korea and China. The species is an uncommon visitor to Pilbara seas between March and May (Johnstone et al. 2013).	**Unlikely** - May fly through and/or forage but not known to breed in Australia.	**Unlikely** - May fly through and/or forage but not known to breed in Australia.
Lesser Frigatebird *Fregata ariel*	MI	SH - L	IA	The Lesser Frigatebird is found in Australian waters from Brisbane in the east, across the northern coast, to around Exmouth in the west, including all associated offshore islands. Lesser Frigatebirds are pelagic for most of their lives but nest on remote tropical and subtropical islands. The species is known to breed on Bedout Island north-east of the Project area, which is a designated BIA for the species.	**Almost Certain** – Expected to occur during breeding season, given known breeding on Bedout Island and overlapping designated foraging BIA	**Almost Certain** – Expected to occur during breeding season, given known breeding on Bedout Island and overlapping designated foraging BIA
Great Frigatebird *Fregata minor*	MI	SH - M		The Great Frigatebird is found across tropical and subtropical oceans. The species is seen occasionally along the Australian coast from the Northern Territory to Queensland, with strays reaching the NSW Central Coast. Breeding occurs on offshore islands, with notable colonies on Ashmore Reef and the Coral Sea. While most frigatebirds are pelagic, Great Frigatebirds spend their non-breeding season on the open sea but return to land to roost, often on small, uninhabited islands	**Rare** – Not expected to occur, not identified in PMST report.	**Unlikely** – May fly through and/or forage but not known to breed in the area.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
White-tailed Tropicbird *Phaethon lepturus*	MI	SH - L	-	At the species level, the White-tailed Tropicbird occupies marine habitats in tropical waters with sea-surface temperatures of more than 22°C. The tropicbird breeds on islands and atolls, where it nests in a variety of habitats including on bare sandy ground, in closed-canopy rainforest, on rocky cliffs and in quarries. In Australia, the White-tailed Tropicbird nests in Pisonia trees amongst Pisonia-coconut vegetation, and on sandy ground. The species breeds in the Cocos-Keeling Islands, Ashmore Reef and Rowley Shoals. In Australian waters they are probably pelagic, as they are rarely found inshore.	**Unlikely** - May fly through but the area is not expected to represent significant foraging habitat – no breeding.	**Unlikely** - May fly through but the area is not expected to represent significant foraging habitat – no breeding.
Christmas Island White-tailed Tropicbird *Phaethon lepturus fulvus*	E, MI	SH - M		The Christmas Island white-tailed tropicbird is endemic to Christmas Island, which is its only known breeding location. It is widely distributed across the island and roosts and forages over the Indian Ocean. The subspecies mostly occurs north of 18°S, but may occur up to about 1500 km from Christmas Island, at the edge of the continental shelf off Western Australia at 21°S. The subspecies is oceanic, feeding on fish and cephalopods in warm tropical waters.	**Rare** – Not expected based on lack of breeding on mainland Australia and distribution predominantly north of 18°S.	**Rare** – Not expected based on lack of breeding on mainland Australia and distribution predominantly north of 18°S.
Red-tailed Tropicbird *Phaethon rubricauda westralis*	MI	SH - L		The Red-tailed Tropicbird has a wide range across the eastern Indian Ocean when not breeding; current breeding areas occur on Christmas Island, Cocos-Keeling Islands, Rowley Shoals, Ashmore Reef and Rottnest Island. The subspecies is pelagic, feeding on fish and cephalopods in warm tropical waters.	**Rare** - May fly through but the area is not expected to represent significant foraging habitat – no breeding.	**Rare** - May fly through but the area is not expected to represent significant foraging habitat – no breeding.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Little Tern *Stemula albifrons*	V, MI	SH - M	MI	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. In north-western Western Australia (from Broome to the Northern Territory), known breeding colonies are small, apparently <20 pairs, but counts of hundreds of non-breeding birds have been made. Non-breeding birds, of the Australian subpopulations and of extralimital populations, extend farther around the Australian coast than known breeding colonies, as well as overlapping extensively with the Australian breeding range. In Western Australia, the species regularly occurs south to approximately 20° S, with occasional records south of there (for example, Shark Bay).	**Rare** – Not expected to occur, not identified in PMST report.	**Possible** - May be found occasionally feeding but the area is not expected to represent significant foraging habitat
Shorebirds						
Red Knot *Calidris canutus*	V, MI	SH - M	EN	The Red Knot is common in all the main suitable habitats around the coast of Australia, as a non-breeding visitor. Very large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. 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.	**Unlikely** - May be found occasionally feeding but the area is not expected to represent significant foraging habitat	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Curlew Sandpiper	CE, MI	SH - M	CR	In Western Australia, the Curlew Sandpiper are widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division, but are more sparsely distributed	**Unlikely** - May fly through but the area is not expected to	**Likely** – expected to occur foraging and roosting. Non-

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Calidris ferruginea				between Carnarvon and Dampier Archipelago. They occur in large numbers, in thousands to tens of thousands, at Port Hedland Saltworks, 80 Mile Beach, Roebuck Bay and Lake Macleod. 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.	represent significant foraging habitat	breeding visitor to Australia.
Great Knot *Calidris tenuirostris*	V, MI	SH - K	CR	The Great Knot winters in Australia, occurring in sheltered coastal habitats such as inlets, bays, harbours, estuaries and lagoons with large intertidal mud and sandflats, oceanic sandy beaches with nearby mudflats, sandy spits and islets, muddy shorelines with mangroves and occasionally exposed reefs or rock platforms. It roosts in refuges such as shallow water in sheltered sites, on coastal dunes or on saltflats amongst mangroves during high tides.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Greater Sand Plover *Charadrius leschenaultii*	V, MI	SH - K	VU	This species inhabits littoral and estuarine habitats, sheltered sandy shelly or muddy beaches with large intertidal mudflats or sandbanks, and sandy estuarine lagoons, inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. Important areas of habitat in Western Australia include Eighty Mile Beach, Roebuck Bay and Ashmore Reef	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Lesser Sand Plover *Charadrius mongolus*	E, MI	SH - K	EN	This species occurs in littoral and estuarine environments, large intertidal sandflats or mudflats, sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. Important	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia. Port

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				Western Australian sites include Eighty Mile Beach, Roebuck Bay, Broome and Port Hedland Saltworks.		Hedland Saltworks identified as Important Bird Area for this species.
Far Eastern Curlew *Numenius madagascariensis*	CE, MI	SH - M	CR	Within Australia, the eastern curlew has a primarily coastal distribution. They have a continuous distribution from Barrow Island and Dampier Archipelago, Western Australia, through the Kimberley and along the Northern Territory, Queensland, and NSW coasts and the islands of Torres Strait. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The eastern curlew roosts during high tide periods on sandy spits, sandbars and islets, especially on beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. The species does not breed in Australia.	**Unlikely** - May fly through but the area is not expected to represent significant foraging habitat	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Little Curlew *Numenius minutus*	MI	SH - K		Little Curlews generally spend the non-breeding season in northern Australia from Port Hedland in Western Australia to the Queensland coast. The Little Curlew is most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. When resting during the heat of day, the Little Curlew congregates around	**Rare** – Not expected to occur, not identified in PMST report.	**Possible** – may occur foraging. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs.		
Australian Painted Snipe *Rostratula australis*	E	SH - M	EN	The Australian Painted Snipe has been recorded at wetlands in all states of Australia. It is most common in eastern Australia, and has been recorded less frequently at a small number of scattered locations in South Australia, the Northern Territory and Western Australia. The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.	**Rare** – Not expected to occur, not identified in PMST report.	**Unlikely** - area is not expected to represent significant foraging habitat.
Common Sandpiper *Actitis hypoleucos*	MI	SH - M	MI	The Common Sandpiper is widespread in small numbers utilising a wide range of coastal wetlands and some inland wetlands where it forages in 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. Areas of national importance within Western Australia include Nuytsland Nature Reserve and Roebuck Bay.	**Unlikely** – Suitable habitat not located within the Project footprint	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.
Marsh Sandpiper *Tringa stagnatilis*	MI	SH - K	MI	The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia. In Western Australia they are mainly found around the coast. 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	**Rare** – Not expected to occur, not identified in PMST report.	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				also regularly at sewage farms and saltworks. In Western Australia they prefer freshwater to marine environments. The species has been recorded roosting or loafing on tidal mudflats, near low saltmarsh, and around inland swamps.		
Common Greenshank *Tringa nebularia*	E, MI	SH - K	MI	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. It occurs around most of the WA coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberleys it is recorded in the south-west and the north-east, with isolated records from the Bonaparte Archipelago. The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Pacific Golden Plover *Pluvialis fulva*	MI	SH - K	MI	Within Australia, the Pacific Golden Plover is widespread in coastal regions. In Western Australia, the species is seldom recorded along the southern or south-western coasts, but is more widespread along the Pilbara and Kimberley coasts between North-West Cape and the Northern Territory border. The Pacific Golden Plover usually forages on sandy or muddy shores (including mudflats and sandflats) or margins of sheltered areas such as estuaries and lagoons, though it also feeds on rocky shores, islands or reefs. In addition, Pacific	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				Golden Plovers occasionally forage among vegetation, such as saltmarsh, mangroves or in pasture or crops.		
Osprey *Pandion haliaetus*	MI	SH - M	MI	The breeding range of the Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in WA to Lake Macquarie in NSW. The distribution of the species around the northern coast appears continuous except for a possible gap at Eighty Mile Beach. 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 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. Osprey breeds from April to February in Australia. Breeding seasons of individual pairs vary according to latitude, with breeding commencing progressively later on a cline from north to south	**Unlikely** – May fly through but the area is not expected to represent significant foraging habitat	**Likely** – expected to occur foraging and roosting. Breeding may occur on some islands, but records are lacking
Grey-tailed Tattler *Tringa brevipes*	MI	SH - K	P4	Within Australia, the Grey-tailed Tattler has a primarily northern coastal distribution and is found in most coastal regions. The species is widespread from the Houtman Abrolhos Islands and the mainland adjacent to the Kimberley Division. The Grey-tailed Tattler is found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. Also found on intertidal rocky, coral or stony reefs, platforms and islets that are exposed at low tide.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Ruddy Turnstone *Arenaria interpres*	V, MI	SH - K	MI	The Ruddy Turnstone is widespread within Australia during its non-breeding period of the year, including from Tasmania in the south to Darwin in the north and many coastal areas in between. It is found in most coastal regions. The Ruddy Turnstone are mainly found on exposed rocks or reefs, often with shallow pools, and on beaches. In the north, they are found in a wider range of habitats, including mudflats. The species roosts on beaches, above the tideline, among rocks, shells, beachcast seaweed or other debris.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Sharp-tailed Sandpiper *Calidris acuminata*	V, MI	SH - M	MI	The Sharp-tailed Sandpiper spends the non-breeding season in Australia. 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. The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season.	**Unlikely** – may fly through occur but in low numbers	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia. Recorded at the Port Hedland Saltworks.
Pectoral Sandpiper *Calidris melanotos*	MI	SH - M	MI	In WA, the Pectoral Sandpiper is rarely recorded. Although it has been recorded in the Pilbara and the Kimberley (Higgins and Davies 1996). The species prefers shallow fresh to saline wetlands and can be found at coastal lagoons, estuaries, bays,	**Unlikely** – may occur but in low numbers	**Unlikely** – may occur but in low numbers

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.		
Oriental Pratincole *Glareola maldivarum*	MI	SH - M	MI	Within Australia the Oriental Pratincole is widespread in northern areas, especially along the coasts of the Pilbara Region and the Kimberley Division in WA. Eighty Mile Beach and Roebuck Plains are considered internationally and important sites. In non-breeding grounds in Australia, the Oriental Pratincole usually inhabits open plains, floodplains or short grassland. 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.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Recorded at the Port Hedland Saltworks. Non-breeding visitor to Australia.
Broad-billed Sandpiper *Limicola falcinellus*	MI	SH - K	MI	In Australia, the Broad-billed Sandpiper is most common on the north and north-west coasts. In Western Australia they mostly occur on the coasts of the Pilbara and Kimberley between Onslow and Broome. 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.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Recorded at the Port Hedland Saltworks. Non-breeding visitor to Australia.
Asian Dowitcher *Limnodromus semipalmatus*	V, MI	SH - L	MI	The Asian Dowitcher is a regular visitor to the north-west between Port Hedland and Broome. Elsewhere they are sporadic and rare. The species occurs in sheltered coastal environments, such as embayments, coastal lagoons, estuaries and tidal creeks. They are known to frequent shallow water	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Recorded at the Port Hedland Saltworks. Non-

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				and exposed mudflats or sandflats. The species is commonly found in the round ponds and channels of saltworks and sewage farms.		breeding visitor to Australia.
Black-tailed Godwit *Limosa limosa*	E, MI	SH - K	MI	The Black-tailed Godwit is found in all states and territories of Australia, however, it prefers coastal regions and the largest populations are found on the north coast between Darwin and Weipa. It is generally found in small numbers elsewhere and there are scattered inland records. 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; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Whimbrel *Numenius phaeopus*	MI	SH - K	MI	The Whimbrel is a regular migrant to Australia, with a primarily coastal distribution. In WA, it is common and widespread from Carnarvon to the north-east Kimberley Division. 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.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Sanderling *Calidris alba*	MI	SH - K	MI	Sanderlings occur on most of the coast from Eyre to Derby, and also around Wyndham. They are more often recorded on the south and southwest coasts, north to around southern Shark Bay, with more sparsely scattered records further north in Gascoyne and Pilbara Regions and the Kimberley Division. Small numbers regularly arrive during late August and early	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				September in the south-west of Western Australia. They roost on/behind, bare sand high on the beach, clumps of washed-up kelp, coastal dunes and rocky reefs and ledges (Higgins and Davies 1996). 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.		
Terek Sandpiper *Xenus cinereus*	V, MI	SH - K	-	In Australia, the Terek Sandpiper has a primarily coastal distribution. In WA, the species is rarely seen on the south coast but is widespread in the Pilbara region and Kimberley Division, from Dampier to Wyndham, with occasional records around Shark Bay. 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.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Oriental Plover *Charadrius veredus*	MI	SH - K	MI	The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the north-western coast, between Exmouth Gulf and Derby in Western Australia. Eighty Mile Beach, Port Hedland and Dampier Saltworks and Roebuck Bay are considered internationally important sites for the species. Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Recorded at the Port Hedland Saltworks. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				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.		
Grey Plover *Pluvialis squatarola*	V, MI	SH – K	MI	There are no published estimates of the extent of occurrence of the Grey Plover in Australia. The species has been recorded in all states, where it is found along the coasts, and it especially abundant on the western and southern coastlines. 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.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Red-necked Stint *Calidris ruficollis*	MI	SH – K	MI	During the non-breeding season, over 80% of the global population of the Red-necked Stint resides in Australia. The species is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. The Red-necked Stint roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation. In north Australia, adults start arriving from the third week of August and most arrive before the end of September, with arrival in southern Australia a couple of weeks later.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia. Port Hedland Saltworks identified as Important Bird Area for this species.
Long-toed Stint *Calidris subminuta*	MI	SH – K	MI	The Long-toed Stint is a regular summer visitor to Australia. In Western Australia the species is found mainly along the coast. It is widespread around the Pilbara region and the Kimberley Division between Karratha and Wyndham-Kununurra. The	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				Long-toed Stint forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands. They occasionally feed on open water, well away from the shore; this is more common in drying ephemeral wetlands. They roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water. It also roosts in small depressions in the mud.		breeding visitor to Australia.
Northern Siberian Bar-tailed Godwit *Limosa lapponica menzbieri*	E, MI	SH – K	MI	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. In Western Australia it is widespread around the coast, from Eyre to Derby, with a few scattered records elsewhere in the Kimberley Division. Eighty Mile Beach and Roebuck Plains are considered internationally and important sites. The Bar-tailed Godwit is found in coastal habitats, particularly large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. The species usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh.	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Bar-tailed Godwit *Limosa lapponica*	MI	SH - K	MI	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. In Western Australia it is widespread around the coast, from Eyre to Derby, with a few scattered records elsewhere in the Kimberley Division. 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	**Rare** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				platforms, and coral reef-flats. The Bar-tailed Godwit usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. The Bar-tailed Godwit usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh.		
Wood Sandpiper *Tringa glareola*	MI	SH - K		The Wood Sandpiper has its largest numbers recorded in north-west Australia, with all areas of national importance located in Western-Australia. The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They also frequent inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. The Wood Sandpiper forages on moist or dry mud at the edges of wetlands, either along shores, among open scattered aquatic vegetation, or in clear shallow water	**Rare** – Not expected to occur, not identified in PMST report.	**Possible** – may occur foraging. Non-breeding visitor to Australia.
Marine Mammals						
Blue Whale *Balaenoptera musculus*	E, MI	SH - L	EN	The blue whale is considered a cosmopolitan species and range from polar to tropical waters. Blue whales, and the pygmy subspecies (*B. m. brevicauda*) are known to aggregate and feed along the southern continental shelf in the Perth Canyon during Summer (Rennie et al. 2009), and migrate west and north along the Australian coast until they reach West Timor and Indonesia (Moller et al. 2020). General distribution of the species is typical in water depths over 200 m and commonly over 1000 m. In the wider region, pygmy blue whales migrate along the 500 m to 1000 m depth contour on the edge of the slope and are likely to feed opportunistically on ephemeral Krill	**Unlikely** - may be found in offshore waters considering BIA for the species overlaps the search area, however still not expected given water depths and known migration route.	**Unlikely** - may be found in offshore waters considering BIA for the species overlaps the search area, however still not expected given water depths and known migration route.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				aggregations. Recent satellite tracking analysis for the pygmy blue whale conducted by Thums et al. (2022) suggests important migration areas encompassed by the Migration BIA in Australia include a broader north-west distribution and migration extent than what was represented during the study. Most whales were found to migrate much further offshore along the north-west part of the Australian coast, even out to the abyssal plain.		
Humpback Whale *Megaptera novaeangliae*	MI	B - K	CD	Humpback Whales may be encountered during their northern migration to breeding grounds in late June to early August, and southern migration (with calves) during late August to mid October. However, the Port Hedland area does not support calving, aggregation or feeding areas	**Likely** – Search area within migratory BIA for the species but large numbers of migrating individuals not expected.	**Likely** – Search area within migratory BIA for the species but large numbers of migrating individuals not expected.
Bryde's Whale *Balaenoptera edeni*	MI	SH - M	MI	Bryde's Whales are found year-round in waters between 40° S and 40° N, primarily in temperatures exceeding 16.3 °C. The coastal form of Bryde's Whale appears to be limited to the 200 m depth isobar, moving along the coast in response to availability of suitable prey. The offshore form is found in deeper water (500 m to 1000 m).	**Unlikely** - may be found, however not expected given water depths	**Unlikely** - may be found offshore, however still not expected given water depths
Killer Whale *Orcinus orca*	MI	SH - M	MI	Killer Whales are cosmopolitan in distribution. The species distribution and occurrence in Australia strongly reflect locations of prey aggregation, particularly breeding and feeding grounds (Morrice 2004), such as those of the humpback whale (Pitman et al. 2015).	**Possible** – may occur in deeper waters particularly during southern humpback whale migrations when hunting for calves.	**Possible** – may occur in deeper waters particularly during southern humpback whale migrations

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
						when hunting for calves.
Australian Humpback Dolphin *Sousa sahulensis*	V, MI	SH - L	P4	Australian Humpback Dolphins are found in tropical, shallow coastal waters and tend to occur in enclosed bays with mangrove forests and seagrass beds, but are also found in open coastal waters around islands and coastal cliffs in association with rock or coral reefs (SEWPaC 2012). In the north-west of Australia, the species has been recorded between Coral Bay and Roebuck Bay (Allen et al. 2012).	**Possible** - May be found in the area but visits will be brief due to port activity.	**Possible** - May be found in the area but visits will be brief due to port activity.
Indian Ocean / Spotted Bottlenose Dolphin *Tursiops aduncus*	MI	SH - K	MI	The Indian Ocean Bottlenose Dolphin tends to occur in deep, open coastal waters (up to 200 m deep), including coastal areas around oceanic islands (SEWPaC 2012).	**Possible** - May be found in the area but visits will be brief due to port activity.	**Possible** - May be found in the area but visits will be brief due to port activity.
Australian Snubfin Dolphin *Orcaella heinsohni*	V, MI	SH - L	MI, P4	Within Australia, Australian Snubfin Dolphins have been recorded almost exclusively in coastal and estuarine waters. The species has been found in the shallow coastal waters and estuaries along the Kimberley coast. Beagle and Pender Bays on the Dampier Peninsula and tidal creeks around Yampi Sound and between Kuri Bay and Cape Londonderry are important areas for Australian Snubfin Dolphins. Australian Snubfin Dolphins share similar habitat preferences with Indo-Pacific Humpback Dolphins. Feeding may occur in a variety of habitats, from mangroves to sandy bottom estuaries and embayments, to rock and/or coral reefs. Feeding primarily occurs in shallow waters (less than 20 m) close to river mouths and creeks.	**Possible** - May be found in the area but visits will be brief due to port activity.	**Possible** - May be found in the area but visits will be brief due to port activity.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Omura's Whale Balaenoptera omurai	M	SH - L		The Omura's whale is one of the most recently described species of baleen whale. Initially known only from stranding and whaling specimens, it has now been identified in all ocean basins excluding the central and eastern Pacific. The species has been sighted along the northwest coast of Australia from Exmouth into the Timor Sea. There is a strong tendency toward a coastal and neritic distribution, although there are also several pelagic records.	**Possible** - May be found in the area but visits will be brief due to port activity.	**Possible** - May be found in the area but visits will be brief due to port activity.
Dugong *Dugong dugon*	MI	SH - K	OS	Dugongs occur in coastal and island waters from Shark Bay in Western Australia across the northern coastline to Moreton Bay in Queensland. Dugongs are seagrass community specialists and the range of the dugong is broadly coincident with the distribution of seagrasses in the tropical and sub-tropical waters in their Australian range.	**Possible** - visits possible, but due to lack of food source and port activity, visits would be brief and rare.	**Possible** - visits possible, but due to lack of food source and port activity, visits would be brief and rare.
Marine Reptiles						
Loggerhead Turtle *Caretta caretta*	E, MI	SH - K	EN	Loggerhead turtles' nest on open, sandy beaches. Western Australia supports one genetic stock of loggerhead turtles with nesting encompassing the Gascoyne (Dirk Hartog Island) to Pilbara (Varanus Island) Regions (Limpus 2002). Foraging occurs in areas of seagrass beds and coral/rocky reefs	**Likely** – Search area adjacent to foraging BIA for the species. Foraging individuals expected to occur but in low numbers.	**Likely** – Search area adjacent to foraging BIA for the species. Foraging individuals expected to occur but in low numbers.
Green Turtle *Chelonia mydas*	V, MI	C - K	VU	Western Australia supports one genetic stock of green turtles nesting from the Gascoyne (Ningaloo Coast) to the Kimberley (Lacepede Islands) Regions (Limpus 2002). Green Turtles spend their first five to ten years drifting on ocean currents. Once Green Turtles reach 30 to 40 cm curved carapace length, they	**Likely** – Search area adjacent to foraging BIA for the species. Foraging individuals	**Likely** – Search area adjacent to foraging BIA for the species. Foraging individuals

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds (Limpus 2008).	expected to occur but in low numbers.	expected to occur but in low numbers.
Leatherback Turtle *Dermochelys coriacea*	E, MI	SH - L	VU	There has been no confirmed breeding of leatherback turtles in Western Australia (Limpus 2009a). Foraging leatherback turtles from foreign rockeries e.g. Indonesia, pass through Western Australian waters.	**Unlikely** – due to absence of breeding areas and shallow waters.	**Possible** – Foraging and migrating individuals may occur.
Hawksbill Turtle *Eretmochelys imbricata*	V, MI	SH - K	VU	Hawksbill Turtles are found in tropical, subtropical and temperate waters in all the oceans of the world. Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in Western Australia (Pendoley 2005). Hawksbill Turtles spend their first five to ten years drifting on ocean currents, Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat (Limpus 2009b).	**Likely** – Search area adjacent to foraging BIA for the species. Foraging individuals expected to occur but in low numbers.	**Likely** – Search area adjacent to foraging BIA for the species. Foraging individuals expected to occur but in low numbers.
Flatback Turtle *Natator depressus*	V, MI	C - K	VU	The Flatback Turtle is found only in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya (DCCEEW 2023). Nesting is confined to Australia and four genetic stocks are recognised (Limpus 2007). Adults inhabit soft bottom habitat over the continental shelf, Post-hatchling and juvenile Flatback Turtles do not have the wide dispersal phase in the oceanic environment like other sea turtles. Female flatback turtles will utilise habitat at two beaches in Port Hedland for nesting purposes; Cemetery Beach and Pretty Pool Beach.	**Almost Certain** – search area within known BIA for breeding and inter-nesting of the species. Search area adjacent to foraging BIA for the species.	**Almost Certain** – search area within known BIA for breeding, inter-nesting and foraging of the species.
Short-nosed Sea Snake	CE	SH - L	CR	The Short-nosed Sea snake is endemic to Western Australia, and has been recorded from Exmouth Gulf, Western Australia	**Unlikely** – species not previously been	**Unlikely** – species not previously been

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Aipysurus apraefrontalis				to the reefs of the Sahul Shelf, in the eastern Indian Ocean. Most specimens have been collected from Ashmore and Hibernia Reefs (Guinea and Whiting 2005). The species prefers the reef flats or shallow waters along the outer reef edge in water depths to 10 m.	recorded from the area. Suitable habitat is either small in area or of low value	recorded from the area. Suitable habitat is either small in area or of low value
Leaf-scaled Sea Snake *Aipysurus foliosquama*	CE	SH - K	CR	Until recently breeding populations of the Leaf-scaled sea snake were only known from Ashmore and Hibernia Reefs in the Timor Sea, but the species has since been found during field surveys in the coastal waters of the Exmouth Gulf (Udyawer et al. 2020). The Leaf-scaled Sea snake occurs in shallow water (less than 10 m in depth), in the protected parts of the reef flat, adjacent to living coral and on coral substrates.	**Unlikely** – species not previously been recorded from the area. Suitable habitat is either small in area of low value	**Unlikely** – species not previously been recorded from the area. Suitable habitat is either small in area of low value
Salt-water Crocodile *Crocodylus porosus*	MI	SH - M		The Salt-water Crocodile is found in Australian coastal waters, estuaries, lakes, inland swamps and marshes. In Western Australia the species is found in most major river systems of the Kimberley. The largest populations occur in the rivers draining into the Cambridge Gulf and the Prince Regent River and Roe River systems. There have also been isolated records in rivers of the Pilbara region, around Derby near Broome and as far south as Carnarvon on the mid-west coast.	**Rare -** not expected due to lack of suitable habitat, water depths and port activities	**Unlikely** –rare sightings within areas of suitable habitat, but likely to avoid areas of high vessel traffic
Sharks and Rays						

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Grey Nurse Shark (west coast population) *Carcharias taurus*	MI	SH - M	VU	Grey nurse sharks have a broad inshore distribution and tend to be found in groups at specific aggregation sites around inshore rocky reefs or islands (Otway et al. 2003). Their distribution in Western Australia is largely confined to the south-west coastal waters (Commonwealth of Australia 2014) and there are no known aggregation sites in Western Australia (Chidlow et al. 2005)	**Unlikely** – not expected due to lack of suitable habitat, water depths and port activities	**Possible** – may be found within suitable habitat around the islands offshore from Port Hedland.
White Shark *Carcharodon carcharias*	V, MI	SH - M	VU	White sharks have a global marine distribution in temperate to tropical latitudes. In Western Australia they are most commonly found in continental shelf waters and around oceanic islands, and are present all year-round in the southwest of the state (McAuley et al. 2017).	**Unlikely** - not expected due to preference for temperate waters and lack of favoured prey.	**Unlikely** - not expected due to preference for temperate waters and lack of favoured prey.
Oceanic Whitetip Shark *Carcharhinus longimanus*	MI	SH - M	-	Oceanic Whitetip Sharks are found in pelagic waters throughout the topics and subtropics. Within Australian waters, it is found from Cape Leeuwin (Western Australia) through parts of the Northern Territory, down the east coast of Queensland and New South Wales to Sydney (Last and Stevens 2009)	**Unlikely** – not expected due water depths and port activities	**Unlikely** – not expected due water depths and port activities
Scalloped Hammerhead *Sphyrna lewini*	CD	SH - L	-	The Scalloped Hammerhead Shark is a coastal pelagic species with a circumglobal distribution in warm temperate and tropical coastal areas between 45°N and 34°S. They are known to form large migratory schools and in Australia tend to move south during the warmer months. Scalloped Hammerheads may be found throughout the seas around northern Australia as far south as Sydney NSW (34°S) and Geographe Bay WA (33°S). Adult Scalloped Hammerheads inhabit deep waters adjacent to continental shelves, in water depths ranging from	**Unlikely** – not expected due water depths and port activities	**Possible** – may be found in deeper waters

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				the surface to at least 275 m in depth, while juveniles are found close to shore in nursery habitats. Adult females are thought to occupy deeper water and move into shallower waters to mate and give birth.		
Whale Shark *Rhincodon typus*	V, MI	SH - M	OS	The whale shark is cosmopolitan in distribution, occurring in all tropical and warm temperate seas apart from the Mediterranean, and inhabits pelagic habitats (Colman 1997). In Western Australia, large numbers of whale sharks aggregate off Ningaloo Reef for several weeks between March and June every year. When sharks depart the Ningaloo Reef they travel northeast along the continental shelf before moving offshore into the northeastern Indian Ocean (Wilson et al. 2006).	**Unlikely** – not expected given absence of significant zooplankton populations	**Unlikely** – not expected given absence of significant zooplankton populations and water depths nearshore.
Dwarf Sawfish *Pristis clavata*	V, MI	SH - K	P1	The Dwarf Sawfish usually inhabits shallow (2–3 m) coastal waters and estuarine habitats, often influenced by large tides. Estuarine habitats are used as nursery areas by Dwarf Sawfish, with immature juveniles remaining in these areas up until three years of age. The majority of capture locations and donated rostra in Western Australia have been between King Sound and Cape Keraudren (Morgan et al. 2011)	**Unlikely** – shallow water coastal species, Project area not preferred habitat.	**Possible** – species has not previously been recorded from the area, but shallow nearshore waters are favoured
Green Sawfish *Pristis zijsron*	V	SH - K	VU	Green sawfish are currently distributed from about the Whitsundays in Queensland across northern Australian waters to Shark Bay in Western Australia and inhabit inshore shallow marine waters. The green sawfish has been recorded in estuaries, river mouths, embankments and along sandy and muddy beaches. The green sawfish has been confirmed through sightings or evidence of rostra in the Karratha area (Morgan et	**Unlikely** – shallow water coastal species, Project area not preferred habitat.	**Likely** – species known to occur within areas of suitable habitat, but likely to avoid areas of high vessel traffic

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				al. 2019; Morgan et al. 2011). Green Sawfish generally have a very small home range, occupy very shallow waters and are likely to avoid areas of high vessel traffic, such as the Port of Port Hedland (Morgan et al. 2017).		
Narrow Sawfish *Anoxypristis cuspidata*	MI	SH - L	-	In Australia, the Narrow Sawfish is found across northern Australia from the Pilbara Coast Western Australia) to Broad Sound (Queensland). It is a bentho-pelagic species that inhabits coastal and estuarine habitats. It occurs to depths of at least 40 m (Last and Stevens 2009). Adults mainly occur offshore while juveniles and pupping females require inshore and estuarine habitats.	**Unlikely** – shallow water coastal species, Project area not preferred habitat.	**Possible** – species has not previously been recorded from the area, but shallow nearshore waters are favoured for pupping females
Reef Manta Ray *Manta alfredi*	MI	SH - K	-	The Reef Manta Ray is commonly sighted on the continental shelf, around tropical and subtropical coral and rocky reefs, islands and along coastlines, preferentially occupying shallow depths < 20 m (Armstrong et al. 2020). Reef Manta Rays are capable of long-distance dispersal when habitat is continuous but also display a high degree of site fidelity.	**Possible** – may be found in areas of suitable habitat adjacent to the Project development footprint	**Likely** – expected to occur in shallow nearshore waters around islands offshore from Port Hedland.
Giant Manta Ray *Manta birostris*	MI	SH - L	-	The Giant Manta Ray has a circumglobal distribution and is considered an oceanic species found predominantly in cooler, temperate to subtropical waters (Last and Stevens 2009).	**Possible** – may be found in deeper waters	**Possible** – may be found in deeper waters

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APPENDIX C – EPBC DATABASE SEARCH RESULTS

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. Please see the caveat for interpretation of information provided here.

Report created: 08-Sep-2025

Summary

Matters of National Environment 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:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	43
Listed Migratory Species:	69

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 https://www.dcceew.gov.au/parks-heritage/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 Lands:	73
Commonwealth Heritage Places:	None
Listed Marine Species:	107
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	1

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	35
Key Ecological Features (Marine):	None
Biologically Important Areas:	5
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In feature area
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In buffer area only
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In buffer area only
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area	In feature area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pluvialis squatarola](#) Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In buffer area only
[Sternula albifrons](#) Little Tern [82849]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Xenus cinereus](#) Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Dasyurus hallucatus](#) Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Macroderma gigas](#) Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Macrotis lagotis](#) Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Orcaella heinsohni](#) Australian Snubfin Dolphin [81322]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Rhinonicteris aurantia (Pilbara form)](#) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Sousa sahulensis](#) Australian Humpback Dolphin [87942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
REPTILE			
[Aipysurus apraefrontalis](#) Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
[Aipysurus foliosquama](#) Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Liasis olivaceus barroni](#) Pilbara Olive Python [66699]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area
SHARK			
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area
[Pristis clavata](#) Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Endangered	Species or species habitat may occur within area	In feature area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
null			
Balaenoptera omurai Omura's Whale [87136]		Species or species habitat likely to occur within area	In feature area
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Macronectes giganteus](#)			
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
[Phaethon lepturus](#)			
White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area	In feature area
[Phaethon rubricauda](#)			
Red-tailed Tropicbird [994]		Species or species habitat likely to occur within area	In feature area
[Sternula albifrons](#)			
Little Tern [82849]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
[Anoxypristis cuspidata](#)			
Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area	In feature area
[Balaenoptera edeni](#)			
Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
[Balaenoptera musculus](#)			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Carcharhinus longimanus](#)			
Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
[Carcharias taurus](#)			
Grey Nurse Shark [64469]		Species or species habitat may occur within area	In feature area
[Carcharodon carcharias](#)			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area
[Caretta caretta](#)			
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In feature area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area	In buffer area only
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In feature area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Endangered	Species or species habitat may occur within area	In feature area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In buffer area only
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area	In buffer area only
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area	In buffer area only
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris falcinellus as Limicola falcinellus Broad-billed Sandpiper [91731]		Species or species habitat known to occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area	In buffer area only
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area	In buffer area only
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis squatarola](#) Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Tringa brevipes](#) Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
[Tringa glareola](#) Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only
[Xenus cinereus](#) Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [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.

Commonwealth Land Name	State	Buffer Status
Unknown		
Commonwealth Land - [51702]	WA	In buffer area only
Commonwealth Land - [51672]	WA	In buffer area only
Commonwealth Land - [51049]	WA	In buffer area only
Commonwealth Land - [51048]	WA	In buffer area only
Commonwealth Land - [51429]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51679]	WA	In buffer area only
Commonwealth Land - [51677]	WA	In buffer area only
Commonwealth Land - [51676]	WA	In buffer area only
Commonwealth Land - [51675]	WA	In buffer area only
Commonwealth Land - [51674]	WA	In buffer area only
Commonwealth Land - [51692]	WA	In buffer area only
Commonwealth Land - [51691]	WA	In buffer area only
Commonwealth Land - [51690]	WA	In buffer area only
Commonwealth Land - [51718]	WA	In buffer area only
Commonwealth Land - [50349]	WA	In buffer area only
Commonwealth Land - [51693]	WA	In buffer area only
Commonwealth Land - [51682]	WA	In buffer area only
Commonwealth Land - [51719]	WA	In buffer area only
Commonwealth Land - [51687]	WA	In buffer area only
Commonwealth Land - [50324]	WA	In buffer area only
Commonwealth Land - [51686]	WA	In buffer area only
Commonwealth Land - [50325]	WA	In buffer area only
Commonwealth Land - [51681]	WA	In buffer area only
Commonwealth Land - [50326]	WA	In buffer area only
Commonwealth Land - [51680]	WA	In buffer area only
Commonwealth Land - [51688]	WA	In buffer area only
Commonwealth Land - [51689]	WA	In buffer area only
Commonwealth Land - [51684]	WA	In buffer area only
Commonwealth Land - [51685]	WA	In buffer area only
Commonwealth Land - [50359]	WA	In buffer area only
Commonwealth Land - [51712]	WA	In buffer area only
Commonwealth Land - [51713]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50327]	WA	In buffer area only
Commonwealth Land - [51716]	WA	In buffer area only
Commonwealth Land - [51717]	WA	In buffer area only
Commonwealth Land - [51710]	WA	In buffer area only
Commonwealth Land - [51711]	WA	In buffer area only
Commonwealth Land - [51053]	WA	In buffer area only
Commonwealth Land - [51704]	WA	In buffer area only
Commonwealth Land - [51714]	WA	In buffer area only
Commonwealth Land - [51705]	WA	In buffer area only
Commonwealth Land - [51715]	WA	In buffer area only
Commonwealth Land - [51678]	WA	In buffer area only
Commonwealth Land - [51683]	WA	In buffer area only
Commonwealth Land - [51947]	WA	In buffer area only
Commonwealth Land - [51709]	WA	In buffer area only
Commonwealth Land - [51708]	WA	In buffer area only
Commonwealth Land - [51404]	WA	In buffer area only
Commonwealth Land - [50323]	WA	In buffer area only
Commonwealth Land - [51666]	WA	In buffer area only
Commonwealth Land - [51720]	WA	In buffer area only
Commonwealth Land - [51667]	WA	In buffer area only
Commonwealth Land - [51706]	WA	In buffer area only
Commonwealth Land - [51055]	WA	In buffer area only
Commonwealth Land - [51054]	WA	In buffer area only
Commonwealth Land - [51703]	WA	In buffer area only
Commonwealth Land - [51403]	WA	In buffer area only
Commonwealth Land - [51700]	WA	In buffer area only
Commonwealth Land - [51668]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51671]	WA	In buffer area only
Commonwealth Land - [51670]	WA	In buffer area only
Commonwealth Land - [51673]	WA	In buffer area only
Commonwealth Land - [51694]	WA	In buffer area only
Commonwealth Land - [51699]	WA	In buffer area only
Commonwealth Land - [51052]	WA	In buffer area only
Commonwealth Land - [51697]	WA	In buffer area only
Commonwealth Land - [51698]	WA	In buffer area only
Commonwealth Land - [51669]	WA	In buffer area only
Commonwealth Land - [51051]	WA	In buffer area only
Commonwealth Land - [51707]	WA	In buffer area only
Commonwealth Land - [51050]	WA	In buffer area only
Commonwealth Land - [51696]	WA	In buffer area only
Commonwealth Land - [51695]	WA	In buffer area only

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris falcinellus as Limicola falcinellus Broad-billed Sandpiper [91731]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In feature area
[Chalcites osculans as Chrysococcyx osculans](#) Black-eared Cuckoo [83425]		Species or species habitat may occur within area overfly marine area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius ruficapillus](#) Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Charadrius veredus](#) Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
[Fregata minor](#) Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In buffer area only
[Glareola maldivarum](#) Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area	In buffer area only
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In buffer area only
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area	In feature area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area	In feature area
Phaethon rubricauda Red-tailed Tropicbird [994]		Species or species habitat likely to occur within area	In feature area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Pluvialis squatarola Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In buffer area only
Sternula albifrons as Sterna albifrons Little Tern [82849]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Fish			
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area	In feature area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area	In feature area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area	In feature area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area	In feature area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In feature area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area	In feature area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In feature area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area	In feature area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area	In feature area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area	In feature area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In feature area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area	In feature area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In feature area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In feature area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area	In feature area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In feature area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In feature area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In feature area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In feature area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area	In feature area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	In feature area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area	In feature area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In feature area
Mammal			
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In feature area
Reptile			
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Aipysurus duboisii Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area	In feature area
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Aipysurus laevis Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area	In feature area
Aipysurus mosaicus as Aipysurus eydouxii Mosaic Sea Snake [87261]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus tenuis Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In feature area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area	In feature area
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area	In feature area
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area	In feature area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydrophis kingii as Disteira kingii			
Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In feature area
Hydrophis macdowelli as Hydrophis mcdowelli			
MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area	In feature area
Hydrophis major as Disteira major			
Olive-headed Sea Snake [93512]		Species or species habitat may occur within area	In feature area
Hydrophis ornatus			
Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area	In feature area
Hydrophis peronii as Acalyptophis peronii			
Horned Sea Snake [93509]		Species or species habitat may occur within area	In feature area
Hydrophis platura as Pelamis platurus			
Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In feature area
Hydrophis stokesii as Astrotia stokesii			
Stokes' Sea Snake [93510]		Species or species habitat may occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata			
Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera edeni			
Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Balaenoptera omurai Omura's Whale [87136]		Species or species habitat likely to occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In feature area
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Sousa sahulensis Australian Humpback Dolphin [87942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Habitat Critical to the Survival of Marine Turtles			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
All year (Jun - Aug)			
Natator depressus			
Flatback Turtle [59257]	Nesting	Known to occur	In feature area

Extra Information

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
Leslie (Port Hedland) Saltfields System	WA	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
East Pilbara Network Stage 1	2024/09933		Completed	In buffer area only
Port Hedland Green Steel Project - Stage 1	2023/09764		Assessment	In buffer area only
Port Hedland Solar Project	2022/09241		Post-Approval	In buffer area only
Ridley Magnetite Project	2023/09477		Referral Decision	In buffer area only
Controlled action				
Additional Rail Infrastructure between Herb Elliott Port Facility and Cloudbreak Mine Site	2010/5513	Controlled Action	Post-Approval	In buffer area only
Great Northern Pipeline - 630 km buried gas pipeline	2009/5257	Controlled Action	Completed	In buffer area only
North Star Magnetite Project	2012/6689	Controlled Action	Post-Approval	In buffer area only
Port Hedland Outer Harbour Development and associated marine and terrestrial in	2008/4159	Controlled Action	Post-Approval	In feature area
Port Hedland Spoilbank Marina, WA	2019/8520	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
150m Boodarie Gas Lateral Pipeline	2014/7116	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Construction of a Commodities Berth, Wharf and Associated Infrastructure	2008/4129	Not Controlled Action	Completed	In buffer area only
Development of iron ore resources in eastern Pilbara region, including port at P	2004/1562	Not Controlled Action	Completed	In buffer area only
Horizon Power South Hedland Transmission Line, WA	2012/6551	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In buffer area only
Iron Bridge Port Facility, Port Hedland, WA	2015/7565	Not Controlled Action	Completed	In buffer area only
Pilbara Bulk Ore Transport System Project, WA	2016/7637	Not Controlled Action	Completed	In buffer area only
Pilbara Transmission Project, Pilbara, WA	2018/8349	Not Controlled Action	Completed	In buffer area only
Port Hedland Channel Risk and Optimisation Project, WA	2017/7915	Not Controlled Action	Completed	In feature area
Port Hedland Power Station Conversion Project	2011/6080	Not Controlled Action	Completed	In buffer area only
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed	In buffer area only
Rail and Port Facilities	2001/474	Not Controlled Action	Completed	In buffer area only
South Hedland Power Station WA	2011/5929	Not Controlled Action	Completed	In buffer area only
Telfer Gold Mine Project - Mine and Borefield Extensions and Upgrade of Storage	2002/787	Not Controlled Action	Completed	In buffer area only
Telfer Gold Mine Project - Power Supply and Infrastructure Corridor	2002/786	Not Controlled Action	Completed	In buffer area only
Walkway Lighting Upgrade	2009/4965	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Additional Rail Infrastructure	2012/6314	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Dredging of marine sediment to enable construction of eight berths and a turnin	2010/5678	Not Controlled Action (Particular	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
		Manner)		
Marine Geotechnical Drilling Program	2008/4012	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Nelson Point Dredging	2009/4920	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT	2014/7223	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Port Headland Outer Harbour Pre-construction Pilling program	2012/6341	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Port of Port Hedland channel marker replacement project, WA	2017/8010	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Realignment of the Great Northern Highway	2010/5793	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
upgrade of 3 community recreation sites	2005/2349	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
Outer Harbour Development and associated marine and terrestial infrastructure	2008/4148	Referral Decision	Completed	In feature area

Biologically Important Areas			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Marine Turtles			
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur	In feature area
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only
Seabirds			

Scientific Name	Behaviour	Presence	Buffer Status
Ardenna tenuirostris Short-tailed Shearwater [84292]	Breeding	Known to occur	In feature area
Fregata ariel Lesser Frigatebird [1012]	Breeding	Known to occur	In feature area
Whales			
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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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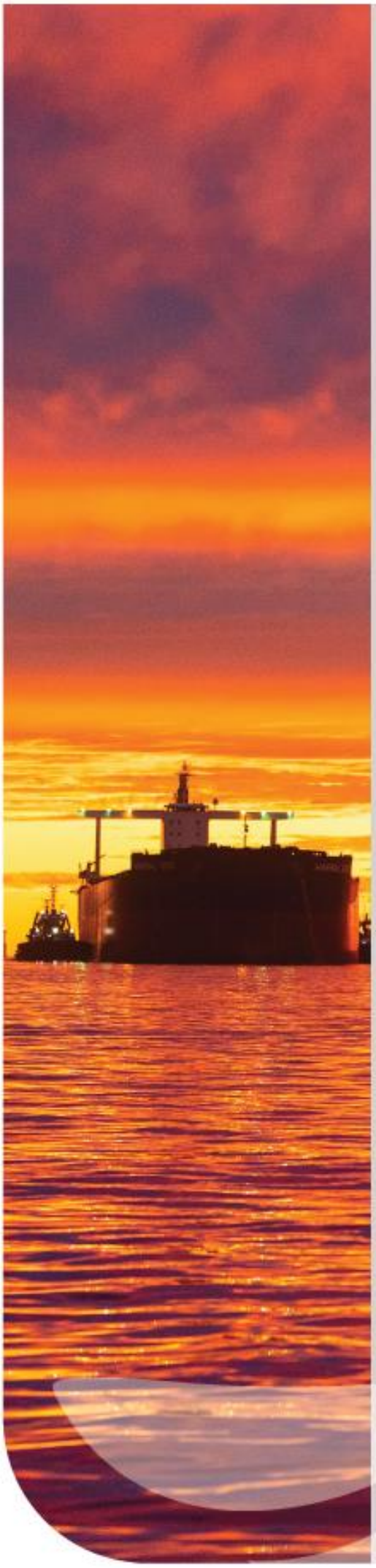
APPENDIX D - CAPITAL DREDGING ENVIRONMENTAL RISK ASSESSMENT



PILBARA PORTS

ENVIRONMENTAL RISK ASSESSMENT – PORT HEDLAND ZONE 5 CHANNEL BYPASS CAPITAL DREDGING WORKS

ASSESSMENT OF POTENTIAL IMPACTS FROM CAPITAL DREDGING

A2100594

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1. INTRODUCTION

1.1 Context

The Port Hedland Zone 5 Channel Bypass Capital Dredging Works (Project), is a strategic marine risk-mitigation project intended to maintain vessel transit at an acceptable reduced capacity, should a grounding incident occur in Zone 5. This section of the channel has been identified as a high-risk area for vessel grounding due to physical characteristics of this length of channel.

While vessel control failures remain relatively infrequent, incidents in recent years have demonstrated that even brief mechanical or navigational issues can escalate quickly within the confined geometry of the channel. The Project is proposed to address this specific vulnerability. It would establish a secondary navigable path adjacent to the existing alignment allowing vessel movements to continue should the main channel become obstructed.

An Options Assessment was conducted to explore a full range of structural and non-structural alternatives to improve channel resilience including dredged bypass alignments, widening of the current channel, operational strategies, and the option of not pursuing capital works.

The options assessment concluded that the proposed (Zone 5) alignment would offer the most favourable balance of dredge volume, navigational safety, and operational performance. This alignment also results in a smaller environmental footprint, and fewer impacts to benthic habitats.

1.2 Background to the Environmental Risk Assessment

In 2012, 2016 and 2017, Pilbara Ports, in conjunction with the Port of Port Hedland Technical Advisory and Consultative Committee (**TACC**) prepared a comprehensive environmental risk assessment (**ERA**) for dredging activities in the Port of Port Hedland through facilitated risk workshops and the performance of environmental control measures has been regularly reviewed and refined through this process. Dredging risks within the Port are therefore well understood.

This ERA follows the established risk assessment procedure outlined in Appendix A. The same methodology has been used for several past dredging campaigns in the Port, including:

- Port Hedland 5-year Maintenance Dredging (2023 - 2028)
- Channel Risk and Optimisation Project (CROP)
- Spoilbank Marina Capital Dredging
- Channel Entrance Project (CEP)

The context of the proposed dredging for the Zone 5 Channel Bypass Capital Dredging Works is the same as for the previous maintenance and capital dredging programs that have been the subject of the Risk Assessment Workshops. As such,

risk knowledge presented here has been drawn from the outcomes of the previous collaborative Risk Assessment Workshops held with the TACC.

1.3 Purpose

The purpose of this document is to present:

- An overview of the comprehensive risk framework (this document) that supports Pilbara Ports' revised ERA for capital dredging activities at the Port;
- A copy of the complete (draft) revised ERA for Port of Port Hedland Zone 5 Bypass Channel Dredge Program for review by the Port of Port Hedland TACC (Appendix A).

The risk assessment framework applied assists Pilbara Ports by identifying whether there are any risks (real or perceived) to the environment from the proposed dredging activities. The final risk assessment will support Pilbara Ports' application for a Commonwealth Sea Dumping Permit for the Zone 5 Bypass Capital Dredging Works, and its outcomes will inform the development of Pilbara Ports' supporting Dredging Environmental Monitoring and Management Plan (DEMMP).

2. RISK ASSESSMENT PROCESS

The following gives some of the framework for the risk assessment and outlines the process to be taken and defines the inputs (Figure 1).

Phase 1 – ***Risk Identification***: what is the activity to be undertaken and what environmental receptors and values may be impacted.

Phase 2 – ***Risk Analysis***: Determining the consequence, likelihood and threat posed by each risk on environmental receptors and values.

Phase 3 – ***Risk Evaluation, Management and Mitigation***: Responses to manage identified risks.

Pilbara Ports notes that the risk framework applied to this ERA is consistent with the framework applied to previous collaborative risk workshops within the Port of Port Hedland, Dampier, and Ashburton TACC forums to support previous maintenance and capital dredging programs undertaken by Pilbara Ports.

As such, Pilbara Ports did not instigate an environmental risk workshop to support the risk assessment process. An overview of the outcomes of the ERA will be shared with the Port Hedland TACC at the next meeting for review and comment.

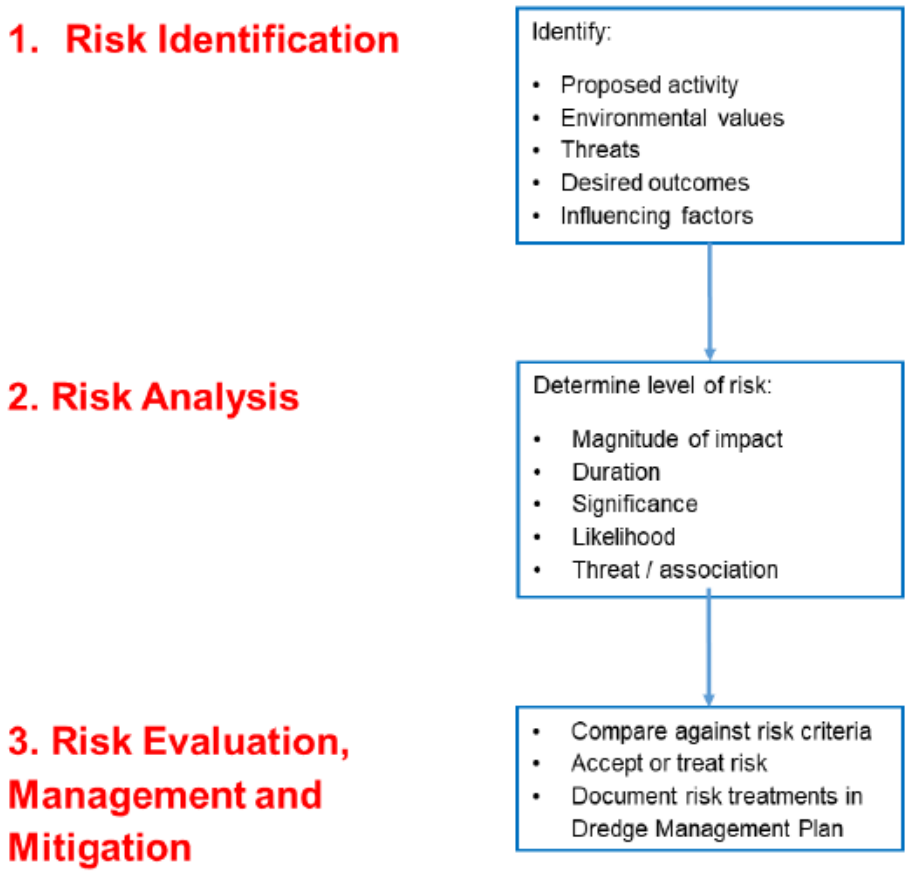

Figure 1: Risk Assessment Process

2.1 Phase 1 – Risk Identification

Dredging has the potential to impact environmental values and sensitive environmental receptors. Environmental values are listed in Table 1.

Table 1: Values to be protected

THEME	FACTOR	OBJECTIVE
Sea	Benthic Communities and Habitat	To protect benthic communities and habitats so that biological diversity and ecological integrity is maintained
	Coastal Processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected
	Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected
	Marine Fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained
People	Social Surroundings	To protect social surroundings from significant harm
	Human Health	To protect human health from significant harm

THEME	FACTOR	OBJECTIVE
	Heritage	To ensure that historical and cultural associations are not adversely affected

Environmental receptors that may be impacted by dredging include:

- Fauna (listed species) under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) or state legislation;
- Fauna other than listed species;
- Marine mammals;
- Turtles;
- Benthic Communities and Habitat (BCH), including corals and seagrasses;
- Heritage – Indigenous and non-indigenous; and
- Amenity – air quality, noise, vibration.

2.2 Phase 2 – Risk Analysis

The risk analysis phase assesses potential risk posed by the dredging activities on environmental values. This phase of the assessment involves the development of a risk assessment matrix based on the data available.

There are three steps to undertaking the risk analysis. These include:

Step 1 – Determining variable consequence score which is based on the magnitude of impact, duration of the impact and the level of significance of the environmental issue being assessed.

Step 2 – Working out a threat score based on likelihood of the event occurring using information on past events where possible to support the conclusion. For sediment quality we use the dredging guidelines

Step 3 – Defining the risk based the level of association or how well linked is the threat to the environmental issue.

These steps are outlined in further detail in the following sections.

2.2.1 Step 1

Each potential risk may result in a consequence or impact, which can be defined by the following metrics:

- Magnitude of impact
- Duration of activity
- Significance of environmental value or receptor being impacted.

Magnitude of Impact

The potential magnitude of impact is rated on a scale of 1 to 5, where 1 represents little or no impact and 5 indicates a significant impact. Table 2 shows the severity criteria that were used to assign a magnitude rating, descriptors are semi-quantitative where possible.

Duration of Activity

The length of time that environmental values and receptors are exposed to risks will affect the potential consequence, the criteria for assigning duration scores is shown in Table 3.

Significance of impact

Environmental receptors that are listed under stated and federal legislation are given greater significance than those that are not, the criteria for assigning significance scores are shown in Table 4.

Table 2 Consequence Criteria

	Insignificant	Minor	Moderate	Major	Catastrophic
Environmental Value	**Minimal, if any, impact which have an overall negligible net effect**	**Localised, reversible short term reversible event with minor effects which are contained to an onsite level**	**Localised but reversible event with moderate impacts on a local level**	**Extensive, long term, but reversible event with high impacts on a regional level**	**Long term, extensive, irreversible with high level impacts at potential state wide levels**
Magnitude Rating	**1**	**2**	**3**	**4**	**5**
Fauna listed under the EPBC Act or state legislation	No detectable impacts on population of a listed species.	Disturbance to local population of listed species impacting normal foraging roosting or reproductive behaviour. Short and long-term viability of individual species not impacted.	Permanent removal of >10% of the regional population but <1% of the state population of a listed species, AND/OR short term removal of >1% of the state or national population of a listed species.	Permanent removal of >20% of the regional population but <1% of the state population of a listed species, AND/OR short term removal of >1% of the state or national population of a listed species.	Permanent removal of >50% of the regional population. Permanent removal of >1% of the state or national population of a listed species.
Fauna other than listed species	No measurable impacts on marine ecological values.	Minor short-term impacts on local marine ecological values, Annual recruitment should still occur. Short and long-term viability of individual species not impacted.	Medium term (<6 month) impacts on local species, life cycle disrupted and resulting in no recruitment for a year. Short-term viability of individual species impacted recovery within 1 -5 years. Long-term viability of species not impacted.	Long term (>6 month) impacts on local species, life cycle significantly disrupted no recruitment for successive years. Short term and long-term viability individual species impacted recovery time frame (5-10 years).	Loss of local species and population. Minimal possibility of recovery.
Marine mammals	No measurable impacts on marine megafauna.	Injury to one individual.	Injury to several individuals.	Death to at least one individual or injury to several individuals.	Death of at least 10 individuals.
Turtles	No measurable impacts.	Impact to one individual.	Impact to up to five individuals.	Disruption to turtle nesting in the vicinity of Port Hedland. Deaths of 10 or more individuals.	Significant disruption to turtle nesting near Port Hedland.
Benthic communities and habitat (BCH) including coral	No measurable impacts on the extent of a coral community.	Permanent loss of up to 5% of benthic primary producer communities within 5 km of mapped benthic primary producer communities.	Permanent loss of 5 to 20% of benthic primary producer communities within 5 km of mapped benthic primary producer communities.	Permanent loss of at between 20 to 40% of benthic primary producer communities within 5 km of mapped benthic primary producer communities.	Permanent loss of > 40% of benthic primary producer communities within 5 km of mapped benthic primary producer communities.
Heritage	No measurable alterations to heritage sites or values.	Detectable impact to single heritage site or value, but no significant reduction in heritage value.	Partial or complete removal of a significant indigenous archaeological site, or some reduction in heritage value.	Regional effects (loss or damage) to significant indigenous archaeological heritage values, or permanent impact to heritage value.	Complete loss or irreparable damage of significant indigenous archaeological records or heritage value.
Amenity	No noticeable impact of dredging activity.	Short term impacts to residents and travellers, but do not affect regional amenity.	Localised impacts, which occur over a long term (< 2 months).	Community perception that the region is damaged and recovery greater than 1-2 years.	Region-wide damaged permanently and recovery, if possible, greater than 2 years.

Table 3: Criteria for assigning duration score

SCORE	DURATION
0	< 1 week
1	>1 week <1 month
2	>1 month <3 months
3	>3 months

Table 4: Criteria for assigning significance score

SCORE	SIGNIFICANT OF ENVIRONMENTAL VALUE
1	Common
2	State significance
3	National significance – listed under the EPBC Act or other Commonwealth environmental or heritage legislation

2.2.2 Step 2 – Assign a likelihood score

The likelihood of a potential risk causing a consequence or impact on an environmental receptor or value is established using existing information and experience from previous dredging campaigns. The criteria for assigning a likelihood score is shown in Table 5.

When considering the risk of dredging to marine sediment quality the likelihood will always be “almost certain”. Therefore, the rating levels from NAGD 2009 are used in lieu of the likelihood rating (Table 6).

Table 5: Criteria for assigning a likelihood score

DESCRIPTOR	SCORE	DESCRIPTION
Almost certain	5	The event is expected to occur in most circumstances during the period under review
Likely	4	The event is likely to occur during the period under review
Possible	3	The event might occur during the period under review
Unlikely	2	The event is not likely to occur during the period under review
Rare	1	The event will only occur in exceptional circumstances during the period under review. No previous occurrence in similar circumstances

Table 6: Criteria for assigning a likelihood score for marine sediment quality. Adapted from NAGD 2009

SCORE	
0	Below Level of Reporting
1	< NAGD Low Screening Levels
2	> NAGD Low Screening Levels < NAGD High Screening Levels
3	> NAGD High Screening Levels
4	2 x NAGD High Screening Levels
5	5 x NAGD High Screening Levels

2.2.3 Step 3 – define a level of association

The term "association" is used to describe the strength of the relationship between the potential risk and the environmental receptor or value. Association is rated low, medium or high (Table 7).

Figure 2 shows a conceptual model of the relationships between dredging operations and environmental receptors and values.

Table 7: Association rating definitions

SCORE	
High	Strong association between stressor and environmental value
Medium	Some association between stressor and environmental value
Low	Unlikely to have an association between stressor and environmental value
None	No association between stressor and environmental value

2.3 Phase 3 – Risk evaluation, management and mitigation

All identified risks are documented in an environmental risk register (Risk Register – Appendix A). Risks can then be accepted or treated. Risk treatments, as well as monitoring and measurement, are documented in the Draft DEMMP.

The risk assessment framework, Risk Register and evidence of stakeholder consultation are all required in order to obtain a Sea Dumping Permit, or vary the associated DMP, from DCCEEW under the Commonwealth *Environment Protection (Sea Dumping) Act 1981.*

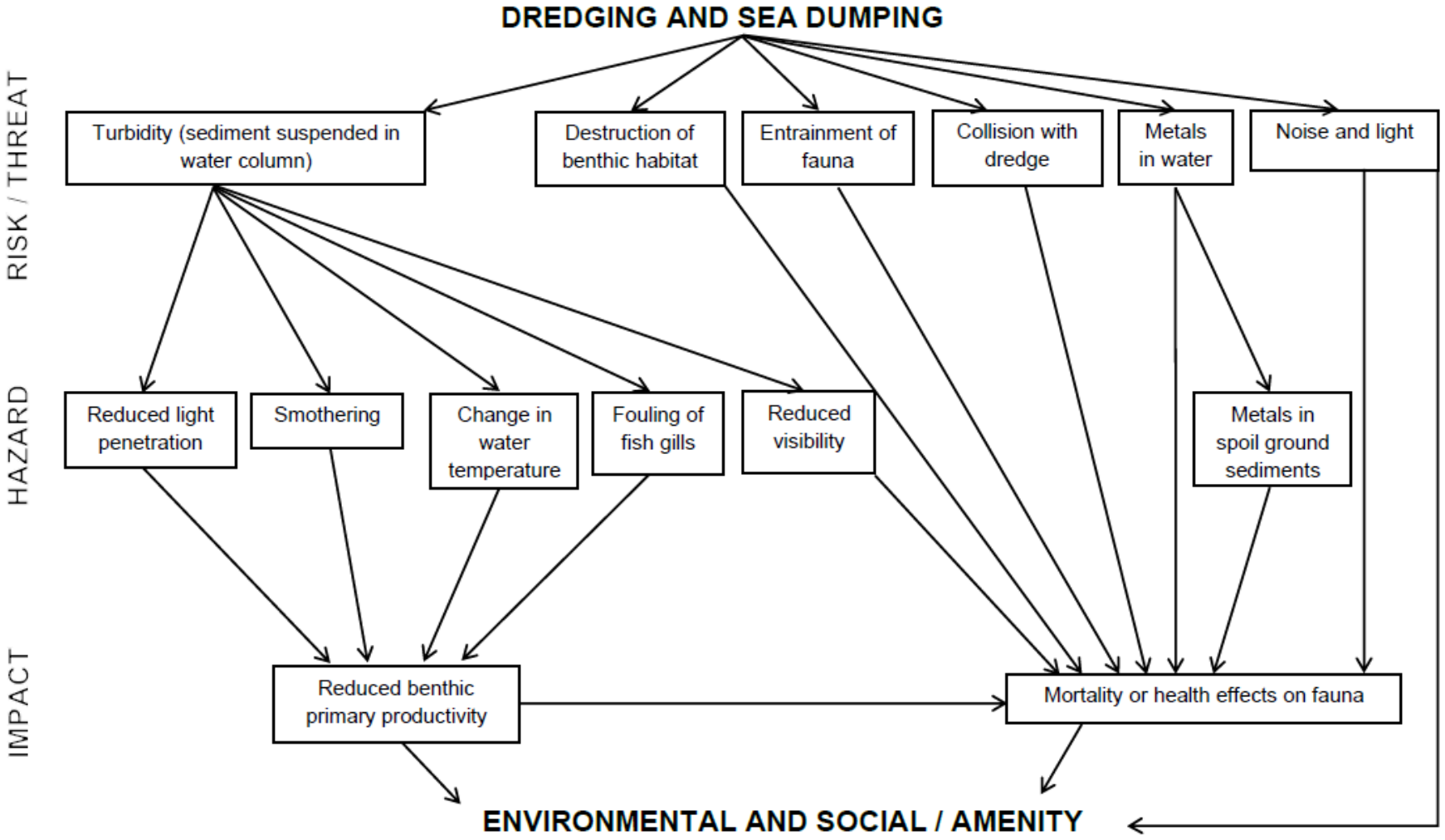

Figure 2: Conceptual model of relationships between risks introduced by dredging and environmental receptors and values (GHD 2020)

3. ENVIRONMENTAL RISK ASSESSMENT OUTCOMES (DRAFT)

In undertaking a preliminary review of the ERA that supports Pilbara Ports' DEMMP for the Port in the context of the proposed action, Pilbara Ports notes that:

- There were no direct of indirect impacts to environmental, social or cultural values from the proposed action additional to those in the existing register.
- Sediments have been tested and categorised as "clean" and fit for unconfined ocean disposal in accordance with the NAGD (no change to risk profile from contamination).
- The existing suite of controls to manage impacts to environmental, social and cultural values from the proposed action were considered suitable (there is no change to risk profile).

The risk assessment has been used to support changes to the draft DEMMP.

Appendix A. Port of Port Hedland Zone 5 Bypass Channel Dredging Risk Register

			CONSEQUENCE RATING					INHERENT RISK – CURRENT SITUATION			
value	location	stressor	magnitude	duration	significance	cons. score	association	threat / likelihood	risk score	comments	actions / mitigation
Fauna listed under the EPBC Act or State legislation	Dredged Areas	Dredge Operations	1	2	National	1	Low	2	L	Likelihood of impact of operations on listed fauna other than marine megafauna is low.	Marine Fauna Observer will be stationed on dredge
Fauna listed under the EPBC Act or State legislation	Dredged Areas	Destruction of benthic habitat	1	3	National	2	Low	2	L	Dredged areas are not likely to be important habitat for any of the listed fish and reptiles and certainly not the avian species. The association is low.	
Fauna listed under the EPBC Act or State legislation	Dredged Areas	Noise and Light	1	2	National	1	Low	2	L	Light and noise from the dredge are localised. Consequences are low.	
Fauna listed under the EPBC Act or State legislation	Dredged Areas	Entrainment of fauna	1	2	National	1	Low	2	L	Low potential for entrainment of listed marine fauna.	Marine Fauna Observer will be stationed on dredge
Fauna listed under the EPBC Act or State legislation	Spoil Ground	Dredge Operations	1	2	National	1	Low	2	L	Likelihood of impact of dredge operations is low as area is not important for listed fauna.	
Fauna listed under the EPBC Act or State legislation	Spoil Ground	Destruction of benthic habitat	1	3	National	2	Low	2	L	Spoil ground is not likely to be important habitat for any of the listed fish and reptiles and certainly not the avian species. The association is low.	
Fauna listed under the EPBC Act or State legislation	Spoil Ground	Noise and Light	1	2	National	1	Low	2	L	Light and noise from the dredge are localised. Consequences are low.	
Fauna listed under the EPBC Act or State legislation	All Areas	Sediment in water column - turbidity	1	2	National	1	Low	2	L	Modelling for the Project indicates turbidity is likely to be of short duration. The magnitude of consequence to listed marine fauna is minor.	
Fauna listed under the EPBC Act or State legislation	All Areas	Toxicants in water column - metals	1	2	National	1	Low	2	L	Metals below NAGD screening levels except for occasional naturally occurring Arsenic, Nickel, Chromium and Cadmium. Elutriate bioavailability testing has shown levels below NAGD screening levels. Period of exposure generally low as time in water column is hours. Pathway of impact is indirect at best.	

			CONSEQUENCE RATING					INHERENT RISK – CURRENT SITUATION			
Fauna listed under the EPBC Act or State legislation	All Areas	Toxicants in sediment - metals	1	3	National	2	Low	2	L	Metals below NAGD screening levels except for occasional naturally occurring Arsenic, Nickel Chromium and Cadmium. Elutriate bioavailability testing has shown levels below NAGD screening levels. Sampling at spoil grounds has shown that contaminants below screening levels.	
Non-listed Fauna	All Areas	Dredge Operations	1	2	Common	1	Low	2	L	Low risk of adverse impacts of dredge operations.	
Non-listed Fauna	All Areas	Destruction of benthic habitat	1	3	Common	1	Low	2	L	Dredged areas and spoil grounds are not likely to be important habitat for species apart from infauna. Limited marine plants if any at the spoil grounds.	
Non-listed Fauna	All Areas	Noise and Light	0	2	Common	0	Medium	2	NA	Light and noise from the dredge are localised. Consequences are negligible	
Non-listed Fauna	All Areas	Entrainment of fauna	1	2	Common	1	Medium	2	L	Likelihood of entrainment of marine fauna such that there are ecological consequences is considered low.	Marine Fauna Observer will be stationed on dredge
Non-listed Fauna	All Areas	Sediment in water column - turbidity	1	2	Common	1	High	2	L	Modelling for the Project and monitoring of previous dredging campaigns suggests that turbidity levels will not impact upon non-listed fauna	
Non-listed Fauna	All Areas	Toxicants in water column - metals	1	2	Common	1	High	2	L	Metals below NAGD screening levels except for occasional naturally occurring Arsenic, Nickel Chromium and Cadmium. Elutriate bioavailability testing has shown levels blow NAGD screening levels. Period of exposure generally low as time in water column is hours.	
Non-listed Fauna	All Areas	Toxicants in water column - hydrocarbons	3	3	Common	2	High	2	L	Although the consequence of an oil spill is high, the likelihood of a dredge plant collision (with other vessel or infrastructure) or grounding resulting in a hydrocarbon spill is low in the context of the existing traffic management at the Port.	
Non-listed Fauna	All Areas	Toxicants in sediment - metals	1	3	Common	1	Medium	2	L	Metals below NAGD screening levels except for occasional naturally occurring Arsenic, Nickel, Chromium and Cadmium. Sampling at spoil ground after dredging has shown that sediment contamination is no different to surrounding sediments.	
Marine mammals	All Areas	Dredge Operations	2	2	National	2	Low	2	L	Generally migration pathways outside dredging ops area. Likelihood of collision with slow moving dredge is low.	

			CONSEQUENCE RATING					INHERENT RISK – CURRENT SITUATION			
Marine mammals	All Areas	Destruction of benthic habitat	1	3	National	2	Low	2	L	No habitat for marine mammals in the dredged areas and limited habitat at spoil ground.	
Marine mammals	All Areas	Noise and Light	1	2	National	1	Low	2	L	Noise and light from dredge unlikely to cause anything but smallest impact on marine mammals.	
Marine mammals	All Areas	Entrainment of fauna	1	2	National	1	Low	2	L	Entrainment into dredge from drag head operating only at the bottom is likely not to occur. Certainly for large fauna like whales there is no pathway.	
Marine mammals	All Areas	Toxicants in water column - hydrocarbons	3	2	National	3	High	2	L	Although the consequence of an oil spill is high, the likelihood of a dredge plant collision (with other vessel or infrastructure) or grounding resulting in a hydrocarbon spill is low in the context of the existing traffic management at the Port.	
Marine mammals	All Areas	Sediment in water column - turbidity	1	2	National	1	Low	2	L	Small areas of turbidity unlikely to impact upon the behaviour or health of marine mammals.	
Turtles	All Areas	Dredge Operations	2	2	National	2	Low	2	L	Dredge slow moving but still chance of collision though serious impact unlikely.	Marine Fauna Observers stationed on dredge.
Turtles	All Areas	Destruction of benthic habitat	1	3	National	2	Low	2	L	Areas where dredging will occur and spoil grounds are not core foraging habitat for turtles and so removal should have little impact.	
Turtles	All Areas	Noise and Light	1	2	National	1	Medium	2	L	Light can distract turtles and cause confusion. Whilst an operating dredge will also be lit for safety and navigational purposes, it is unlikely that this lighting would impact upon nesting turtles and hatchlings (particularly in context of operational Port environment with existing lighting of shipping and industry).	
Turtles	All Areas	Entrainment of fauna	3	2	National	3	Medium	3	L	Expected duration of dredging is likely to be short (5 weeks). If no mitigation measures, then there is potential for entrainment of turtles from the Trailer Suction Hopper Dredge (TSHD).	Use of tickler chains on dredge. Marine Fauna Observers stationed on dredge. Dredge pumps not to be used when drag head is off the bottom. If these measures are in place, the

			CONSEQUENCE RATING					INHERENT RISK – CURRENT SITUATION			
											residual risk is considered to be low.
Turtles	All Areas	Sediment in water column - turbidity	1	2	National	1	Medium	2	L	Plumes of sediment generated by dredging exist for very short duration and have limited extent, therefore unlikely to have impact upon turtle populations. Turbidity generated at dredging areas and from disposal activities at spoil grounds is not predicted to extend to important foraging areas and will be offshore from recognised nesting areas so impact on adults and hatchlings is expected to be low.	
Turtles	All Areas	Toxicants in water column - metals	1	2	National	1	Low	2	L	Short duration exposure. Indirect pathway and sediments below NAGD screening levels except for naturally occurring metals.	
Turtles	All Areas	Toxicants in sediment - metals	0	3	National	0	Low	2	NA	No direct pathway of impact. Risk included in table for due diligence purposes.	
Benthic Primary Producer Habitat (BPPH)	All Areas	Dredge Operations	0	2	State	0	Low	1	NA	No direct pathway of impact. Risk included in table for due diligence purposes.	
Benthic Primary Producer Habitat (BPPH)	All Areas	Destruction of benthic habitat	1	3	State	1	High	4	L	Small area of impact in already dredged areas of the channel and at spoil grounds with little benthic primary producer habitat (BPPH) recorded.	
Benthic Primary Producer Habitat (BPPH)	All Areas	Noise and Light	0	2	State	0	Low	1	NA	No direct pathway of impact. Risk included in table for due diligence purposes.	
Benthic Primary Producer Habitat (BPPH)	Dredged Areas	Entrainment of fauna	1	2	State	1	High	2	L	Small area of impact in already dredged areas and at spoil grounds with little BPPH recorded. Therefore, impacts on those BPPH entrained into the dredge are low.	
Benthic Primary Producer Habitat (BPPH)	All Areas	Sediment in water column - turbidity	2	2	State	1	High	3	L	Impacts from light attenuation and smothering are well linked with BPPH. Modelling for the proposal predicts plumes of a frequency, intensity and duration with potential to impact BPPH will cover a small extent and not overlap known sensitive receptor sites.	
Benthic Primary Producer Habitat (BPPH)	All Areas	Toxicants in water column - metals	1	2	State	1	Low	2	L	Metals likely below NAGD screening levels except for occasional naturally occurring Arsenic, Nickel Chromium and Cadmium. Time in water column is short and pathway not strong.	

			CONSEQUENCE RATING					INHERENT RISK – CURRENT SITUATION			
Benthic Primary Producer Habitat (BPPH)	All Areas	Toxicants in sediment - metals	1	3	State	1	High	2	L	Limited BPPH at spoil grounds where sediments below NAGD screening levels after disposal.	
Coral	All Areas	Dredge Operations	1	2	State	1	Low	1	L	No pathway of impact.	
Coral	Dredged Areas	Destruction of benthic habitat	1	3	State	1	Low	1	L	Only a few isolated patches of coral occur in the bypass channel design.	
Coral	Dredged Areas	Entrainment of fauna	1	2	State	1	Low	1	L	Only a few isolated patches of coral occur in the proposed channel design	
Coral	Dredged Areas	Sediment in water column - turbidity	3	2	State	2	High	2	L	Turbidity is likely to be short-lived over coral areas and only infrequently will this occur.	
Coral	Spoil Grounds	Destruction of benthic habitat	1	3	State	1	High	1	L	No coral mapped within or adjacent to the spoil ground	
Coral	Spoil Grounds	Sediment in water column - turbidity	1	2	State	1	High	2	L	Impacts from light attenuation and smothering are well linked with BPPH. Modelling for the proposal predicts plumes of a frequency, intensity and duration with potential to impact BPPH will cover a small extent and not overlap known sensitive coral receptor sites.	
Coral	Spoil Grounds	Toxicants in water column - metals	1	2	State	1	Low	2	L	No coral at spoil ground and sediments unlikely to pose threat to coral.	
Introduced Marine Pests	All Areas	Dredge Operations	2	1	National	1	Medium	2	L	Introduction of marine pests on dredge travelling to Port Hedland from international or interstate locations. Dredge operations may be halted while pests are removed.	
Introduced Marine Pests	All Areas	Destruction of benthic habitat	2	3	National	3	Medium	2	L	Disturbance of habitat may could provide area for introduced marine pests to colonise. The IMP may be impossible to eradicate.	
Amenity - Sensory Perception (Air, Noise, Vibration)	All Areas	Dredge Operations	1	2	Common	1	High	4	L	Dredging will occur in the context of a busy Port environment. Additional movements by dredging vessel(s) considered negligible in context of broader Port operations. Risk is considered low.	
Amenity - Sensory	All Areas	Noise and Light	2	2	Common	1	High	4	L	Dredging will occur in the context of a busy Port environment. Additional movements by dredging vessel(s) considered negligible in	

			CONSEQUENCE RATING					INHERENT RISK – CURRENT SITUATION			
Perception (Air, Noise, Vibration)										context of broader Port operations. Risk is considered low.	
Indigenous Cultural Heritage	All Areas	Dredge Operations	0	2	National	0	Low	1	NA	Low impact likely	
Indigenous Cultural Heritage	All Areas	Destruction of benthic habitat	0	3	National	0	Low	1	NA	Indirect impacts through effects on other environmental values and as these are considered low risk is considered low.	
Indigenous Cultural Heritage	All Areas	Noise and Light	0	2	National	0	Low	1	NA	Low impact likely.	
Indigenous Cultural Heritage	All Areas	Entrainment of fauna	0	2	National	0	Low	1	NA	Indirect impacts through effects on other environmental values and as these are considered low risk is considered low.	
Indigenous Cultural Heritage	All Areas	Sediment in water column - turbidity	2	2	National	2	Low	1	L	Indirect impacts through effects on other environmental values and as these are considered low risk is considered low.	
Non-indigenous Cultural Heritage	All Areas	Destruction of benthic habitat	0	3	Common	0	Low	1	NA	No pathway of impact	
Non-indigenous Cultural Heritage	All Areas	Noise and Light	0	2	Common	0	Low	1	NA	No pathway of impact	
Non-indigenous Cultural Heritage	All Areas	Entrainment of fauna	0	2	Common	0	Low	1	NA	No pathway of impact	
Fauna listed under the EPBC Act or State legislation	Dredged Areas	Dredge Operations	1	2	National	1	Low	2	L	Likelihood of impact of operations on listed fauna other than marine megafauna is low.	Marine Fauna Observer will be stationed on dredge

4. DOCUMENT OWNER

The Environment and Heritage Superintendent (Port Hedland) is responsible for this Environmental Risk Assessment for Zone 5 Bypass Channel Capital Dredge.

Date approved: 02/04/2026	Review date: 02/04/2026
Version: 1	Approved by: Lucy Georgiou (Environment and Heritage Superintendent)