WESTERN GAS

WA-474-P, WA-70-R SUSPENDED WELLS

ENVIRONMENT PLAN APPENDICES

Document No.:	**WGC-HSE-PLN_Suspended Wells_Appendices**	**Revision:**	**1**
Revision Date:	**20 March 2023**	**Copy No:**	**N/A**

DOCUMENT INFORMATION

Document No:	WG-HSE-PLN-001	**Revision:**	1
Document Owner:	Western Gas Executive Director		

REVISION HISTORY

Rev.	Description	Prepared by	Reviewed by	Approved by	Date
0	Issued for submission	AF/AH	MH	CM	15/12/2022
1	Issued for resubmission	AF/AH	MH	CM	22/03/2023

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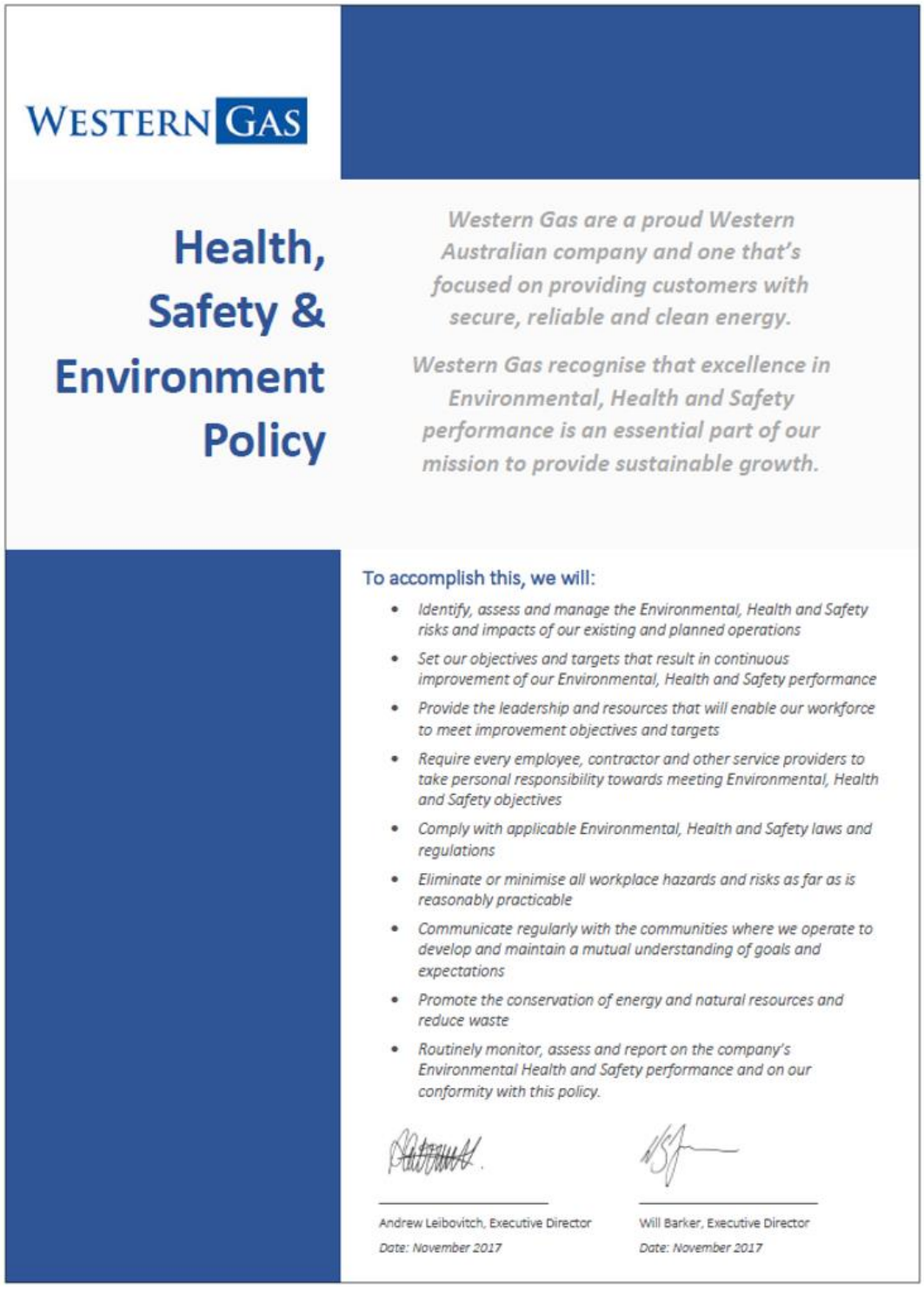


WESTERN GAS

Health, Safety & Environment Policy

Western Gas are a proud Western Australian company and one that's focused on providing customers with secure, reliable and clean energy.

Western Gas recognise that excellence in Environmental, Health and Safety performance is an essential part of our mission to provide sustainable growth.

To accomplish this, we will:

- *Identify, assess and manage the Environmental, Health and Safety risks and impacts of our existing and planned operations*
- *Set our objectives and targets that result in continuous improvement of our Environmental, Health and Safety performance*
- *Provide the leadership and resources that will enable our workforce to meet improvement objectives and targets*
- *Require every employee, contractor and other service providers to take personal responsibility towards meeting Environmental, Health and Safety objectives*
- *Comply with applicable Environmental, Health and Safety laws and regulations*
- *Eliminate or minimise all workplace hazards and risks as far as is reasonably practicable*
- *Communicate regularly with the communities where we operate to develop and maintain a mutual understanding of goals and expectations*
- *Promote the conservation of energy and natural resources and reduce waste*
- *Routinely monitor, assess and report on the company's Environmental Health and Safety performance and on our conformity with this policy.*

Andrew Leibovitch, Executive Director
Date: November 2017

Will Barker, Executive Director
Date: November 2017

APPENDIX B: DECOMISSIONING OPTIONS EVALUATION WORKSHOP OUTCOMES

Criteria	Sub-criteria	Description	Options							
			Removal (External cutting above the mudline)		Removal (Internal cutting below the mudline)		Leave In-situ		Install Cover/Cap	
			Justification	Score	Justification	Score	Justification	Score	Justification	Score
Environment	Water quality and sediment quality	Assessment of water and sediment quality.	If part of the the wellhead is left in-situ as a result of external cutting it would slowly degrade overtime releasing corrosion material. The wellhead is comprised predominantly of mild steel, iron the primary component of steel (98%) is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997). Based on the low toxicity of iron, the slow release rate and rapid dilution of the open ocean environment, any impacts to sediments and water quality will be low and in the immediate vicinity of the wellhead. If there are any external obstructions, sediment removal may be required to access the wellhead in an appropriate manner. No risk of LOWC as adequate well control barriers are in place via the plugging and abandonment oprations. Vessel discharges and vessel MDO risk associated with the vessel campaigns.	Least Preferred	Short-term local impact to water and sediment quality during the removal process. An internal cutting tool will be used to cut below the mudline. No risk of LOWC as adequate well control barriers are in place via the plugging and abandonment oprations. Vessel discharges and vessel MDO risk associated with the vessel campaigns.	Least Preferred	If the wellhead is left in-situ it would slowly degrade overtime releasing corrosion material. The wellhead is comprised predominantly of mild steel, iron the primary component of steel (98%) is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997). Based on the low toxicity of iron, the slow release rate and rapid dilution of the open ocean environment, any impacts to sediments and water quality will be low and in the immediate vicinity of the wellhead. No risk of LOWC as adequate well control barriers are in place via the plugging and abandonment oprations. No vessel discharges or vessel MDO risk.	Most preferred	If a cover/cap is installed it would slowly degrade overtime releasing corrosion material. The cover/cap is comprised predominantly of mild steel, iron the primary component of steel (98%) is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997). Based on the low toxicity of iron, the slow release rate and rapid dilution of the open ocean environment, any impacts to sediments and water quality will be low and in the immediate vicinity of the wellhead. No risk of LOWC as the well did not enter production. Vessel discharges and vessel MDO risk associated with the single vessel campaign.	-
	Ecological services	Assessment of biodiversity and habitat changes due to the physical presence of infrastructure, and seabed disturbance because of the petroleum activity.	Due to the depth and age of the wellheads, it is unlikely that there will be significant marine growth, however in the event of external cutting above the mudline for the removal of the wellhead, ~~most~~ marine growth around/on the well will be removed. A portion of infrastrucure will remain above the seabed (marine growth on this piece will remain / re-grow). Over time the remaining infrastructure will deteriorate. Vessel and ROV activity with associated impacts and risks to the marine environment. No risk of LOWC as adequate well control barriers are in place via the plugging and abandonment oprations.	-	Due to the depth and age of the wellheads, it is unlikely that there will be significant marine growth, however in the event of internal cutting below the mudline for the removal of the wellhead, marine growth around/on the well will be removed. Seabed disturbance will occur as a result of cutting below the mudline and lifting the infrastructure to remove from the ground. Vessel and ROV activity with associated impacts and risks to the marine environment. No risk of LOWC as adequate well control barriers are in place via the plugging and abandonment oprations.	-	If marine growth is present around/on the well, it will remain. No vessel or ROV activity, therefore no associated impacts or risks to the marine environment. No LOWC risk as the well did not encounter hydrocarbons.	Most preferred	Any marine growth around/on the well may not survive as a result of being trapped by the cover/cap. Installing a cover/cap will create a alrger seabed footprint and higher profile to cover the wellhead. Vessel and ROV activity with associated impacts and risks to the marine environment. No LOWC risk as the well did not encounter hydrocarbons.	Least Preferred
	Emissions	Emissions such as light, noise, atmospheric (including GHG) and marine discharges.	Vessel and ROV activity creating light, noise and atmospheric (including GHG) emissions, discharges, and both minor and major MDO spill risk.	-	Vessel and ROV activity creating light, noise and atmospheric (including GHG) emissions, discharges, and both major and minor MDO spill risk.	-	No vessel or ROV activity, therefore no associated emissions, discharges, or MDO spill risk.	Most preferred	Vessel and ROV activity creating light, noise and atmospheric (including GHG) emissions, discharges, and both major and minor MDO spill risk.	-
	Waste	Volume and type of waste associated with offshore operations (e.g. landfill, recyclables).	General vessel operations related waste (food, grey water, bilge, cooling water) Onshore disposal required of retrieved well materials (concrete, steel, etc.).	-	General vessel operations related waste (food, grey water, bilge, cooling water) Onshore disposal required of retrieved well materials (concrete, steel, etc.).	-	No waste generated by the vessel operations. No need for onshore disposal of of well materials (concrete, steel, etc.)	Most preferred	General vessel operations related waste (food, grey water, bilge, cooling water)	-
Technical Feasibility	Engineering and execution complexity	The extent to which the option requires the use of proven technology. The ability to recover from unplanned excursions and complete the planned option.	Cutting above the mudline using a cutting tool such as a diamond wire saw (DWS). This tool may require removal of sediment to reach a suitable point for cutting, which would result in seabed disturbance. This option is feasible, however other options may be more suitable to ensure that seabed disturbance is less impacted. The wellheads are located in 1,100-1,125 m of water, this exceeds max operating depth for air diving, consequently ROV operations are required for removal.	Least Preferred	Cutting below the mudline would require removal of sediment to a suitable point (e.g. jetting). This would be the most complex option associated with the removal of the wellheads	Least Preferred	Leaving in-situ ensures the material remains in the one location and poses no technical risk. Therefore, the preference from a technical feasibility perspective is to leave the wellhead in place.	Most preferred	A larger vessel with crane capability required to maneuver the cover/cap.	-
Health and Safety	Risk to personnel (offshore and onshore)	Health and safety risks to company-related personnel both onshore (e.g. logistics) and offshore.	Complete removal may require more than one single campaign and associated vessel hours, land logistics, supply needs, waste disposal health and safety risks.	-	Complete removal may require more than one single campaign and associated vessel hours, land logistics, supply needs, waste disposal health and safety risks.	-	No health and safety risk to personnel as no removal camapign/s would be created.	Most preferred	Installing a cover/cap would require one campaign and associated vessel hours, land logistics, supply needs, waste disposal health and safety risks.	-
	Residual risk to other marine users	Health and safety risks to marine users such as commercial vessels, fishers and members of the public.	Given the remote offshore location of the wellhead and the water depth of 1,110-1,250 m, no credible health and safety risks to marine users have been identified. The wellhead has been in place since ~2010 and no harm or events are known. Commercial fisheries are not active at this depth or region.		Given the remote offshore location of the wellhead and the water depth of 1,110-1,250 m, no credible health and safety risks to marine users have been identified. The wellhead has been in place since ~2010 and no harm or events are known. Commercial fisheries are not active at this depth or region.		Given the remote offshore location of the wellhead and the water depth of 1,110-1,250 m, no credible health and safety risks to marine users have been identified. The wellhead has been in place since ~2010 and no harm or events are known. Commercial fisheries are not active at this depth or region.		Given the remote offshore location of the wellhead and the water depth of 1,110-1,250 m, no credible health and safety risks to marine users have been identified. The wellhead has been in place since ~2010 and no harm or events are known. Commercial fisheries are not active at this depth or region.	
Social	Effect on commercial fisheries	Displacing commercial fisheries or affecting their catch.	The wellhead may not be able to be removed at/below the seabed with this method, therefore snag risk remains to trawl fishing operations, however, commercial fishing is not known to occur in the operational area. Vessel activity and associated impacts and risks for no additional benefit.		Complete removal of the well below the seabed. No snag risk to commercial fisheries if they operate in the region in the future.		Snag risk remains to trawl fishing operations, however, commercial fishing is not known to occur in this area.		The presence of a cover/cap still poses potential snag risk for trawl fishing due to the extended height added over the wellhead. However, commercial fishing is not known to occur in this area. Vessel activity and associated impacts and risks for no extra benefit.	
	Other socio-economic effects	Effects on local communities, recreational users, commercial activities, etc.	Reputational benefits as a responsible petroleum operator.	Most preferred	Reputational benefits as a responsible petroleum operator.	Most preferred	Possibility of reputational impacts.	Least Preferred	Potential reputational benefits as a responsible petroleum operator for attempting to address the legacy asset.	-
Economic	Financial cost	Operational / capital costs to Western Gas.	Costs are associated with vessel use, personnel, removal of the wellhead and disposal of the wellhead	Least Preferred	Costs are associated with vessel use, personnel, removal of the wellhead and disposal of the wellhead	Least Preferred	No cost	Most preferred	Costs are associated with vessel use, personnel, design and implementation of the wellcap	Least Preferred

APPENDIX C: EXISTING ENVIRONMENT

1 REGIONAL SETTING

The Operational Area for the proposed Activity lies within the Northern Carnarvon Basin, approximately 150 km from the closest mainland coast and approximately 135 km from Barrow Island (refer to EP Figure 2-1). The area lies directly north of Exmouth, and occurs within waters approximately 9,00 m to 1,200 deep.

This document provides details of the sensitivities that occur within the Operational Area, as well as those that occur within the environment that may be affected (EMBA) by unplanned events associated with the Activity. The largest EMBA identified for the Activity is that associated with a potential diesel spill as a result of a vessel collision. This EMBA encompasses all other activity-specific EMBAs (e.g. area that may be influenced by underwater noise), and includes the Operational Area.

Australia's offshore waters have been divided into six marine bioregions to facilitate their management by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EMBA sits entirely within the North-West Marine Region (NWMR). Within this region, the EMBA intersects six (6) smaller bioregions based upon the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) (Table 1-1).

The operational area for this activity is located in Commonwealth waters within the North West Shelf Province, in water depths of approximately 800 m – 1,200 m. These bioregions fall within the NWMR, as defined under IMCRA, and are based on fish, benthic habitats and oceanographic data.

Table 1-1: Australian Bioregions within the EMBA

Name	Hydrocarbon Presence	
	Operational Area	EMBA
Northwest Province	-	✓
Northwest Shelf Province	-	✓
Northwest Transition	-	✓
Central Western Transition	-	✓
Central Western Shelf Transition	-	✓
Central Western Shelf Province	-	✓

The NWMR encompasses Commonwealth waters from the Western Australia (WA)/Northern Territory (NT) border in the north, to Kalbarri in the south (DSEWPC, 2012). The region's north-western boundary is defined in accordance with the Perth Treaty, negotiated with the Republic of Indonesia, and includes area over which Australia exercises jurisdiction over both the water column and the seabed and its associated resources (DEWHA, 2008).

The NWMR consists entirely of continental slope and is characterised by muddy sediments and water depths that predominately range between 1,000 to 3,000 m (DEWHA. 2008). The Exmouth Plateau is the dominant topographical feature within the North West Province, with water depth ranges from 30 to 60 m, is virtually flat and overlain by sparse sandy substrata. Relict sediments are also present and rhodolith beds of coralline red algae growing on rocks occur between 30 and 90 m (DEWHA 2007). In the deeper waters of the mid shelf (60 to 100 m), sediments comprise sands and gravels on cemented hard grounds. It is reasonably barren substratum with 50% comprising relict reworked material, such as ooid old shoal; hence, there is little recent organic material, and the substrata support a generally low biota (DEWHA, 2007). The sediments of the outer shelf (100 to 200 m) comprise sands and gravels, transitioning to muds with increasing distance offshore. Detrital rain transports some organic material to the seafloor; however, there is believed to be very few benthic living organisms on this outer shelf (DEWHA, 2007).

2 PHYSICAL ENVIRONMENT

2.1 CLIMATE AND METEROLOGY

The EMBA experiences an arid/sub-tropical climate and a distinct summer monsoonal 'wet' season from November to February, followed by a typically cooler winter 'dry' season (DEWHA, 2008). Historical rainfall data shows the highest mean monthly rainfall occurs from January to June (BoM, 2021). The climate is controlled by two major atmospheric pressure systems: Indian Tropical Maritime air moving in from the west or north-west, and tropical continental air from the inland (ANRA, 2013).

The northwest coast between Broome and Exmouth experiences on average about five tropical cyclones between November to April each year (BoM, n.d.). Cyclones can bring in vast amounts of rain into the area, with strong swell and rough seas common during these meteorological events. Most cyclones approach the region from the east-northeast, veering to a southerly track the farther south they go (BoM, n.d.). Observations from the Learmonth weather station are summarised in Table 2-1 and shown in

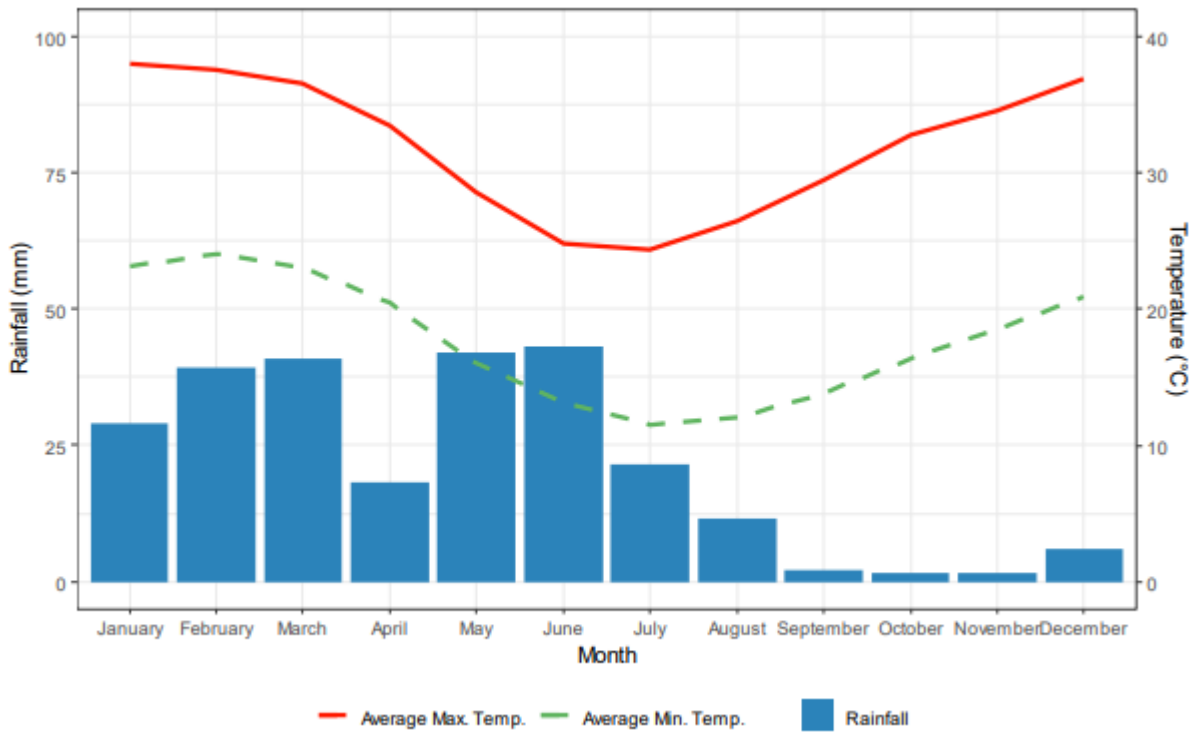


Figure 2-1.

Historical rainfall data indicates the highest rainfall occurs in late autumn/early winter (May to June), while the lowest rainfall occurs in late spring/early summer (October to December).

Table 2-1: Meteorological conditions (Learmonth) representative of the EMBA (BoM, n.d.)

Month	Mean Maximum Monthly Temperature (°C)	Mean Minimum Monthly Temperature (°C)	Mean Rainfall (mm)
January	38.0	23.1	29.1
February	37.5	24.0	39.2
March	36.5	23.0	40.9
April	33.4	20.5	18.1
May	28.6	16.0	41.9
June	24.8	13.1	43.1
July	24.4	11.5	21.5
August	26.5	12.1	11.6
September	29.5	13.8	2.0
October	32.8	16.4	1.5
November	34.6	18.5	1.7
December	36.9	20.9	6.0
Annual Average	**32.0**	**17.7**	**251.5**

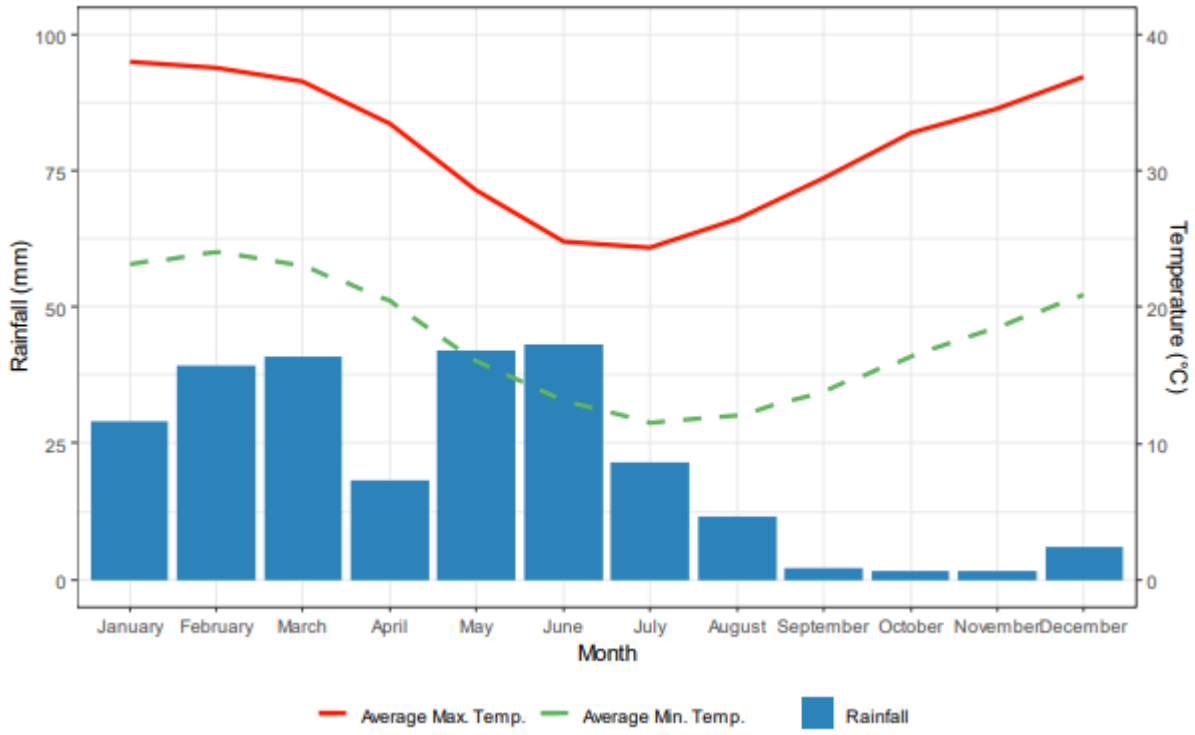


Figure 2-1: Monthly average maximum temperature, minimum temperature, and rainfall from Learmonth meteorological station (BoM, n.d.)

Sea surface wind data was sourced from the National Centre for Environmental Predictions (NCEP) Climate Forecast System Reanalysis. Table 2-2 and Figure 2-2 presents wind data from the nearest NCEP wind station to Exmouth.

Table 2-2: Predicted average and maximum winds from the closest station to Exmouth (RPS, 2022)

Month	Average wind (knots)	Maximum wind (knots)	General direction
January	14.2	53.4	Southwest
February	13.2	43.5	Southwest
March	12.0	37.5	Southwest
April	11.4	49.9	South
May	11.5	40.5	Southeast
June	13.0	38.7	Southeast
July	13.0	28.3	Southeast
August	12.0	30.2	South
September	13.1	29.2	Southwest
October	14.5	28.6	Southwest
November	14.9	29.1	Southwest
December	14.6	31.0	Southwest
Minimum	**11.4**	**28.3**	**-**
Maximum	**14.9**	**53.4**	**-**
Annual Average	**13.1**	**36.7**	**-**

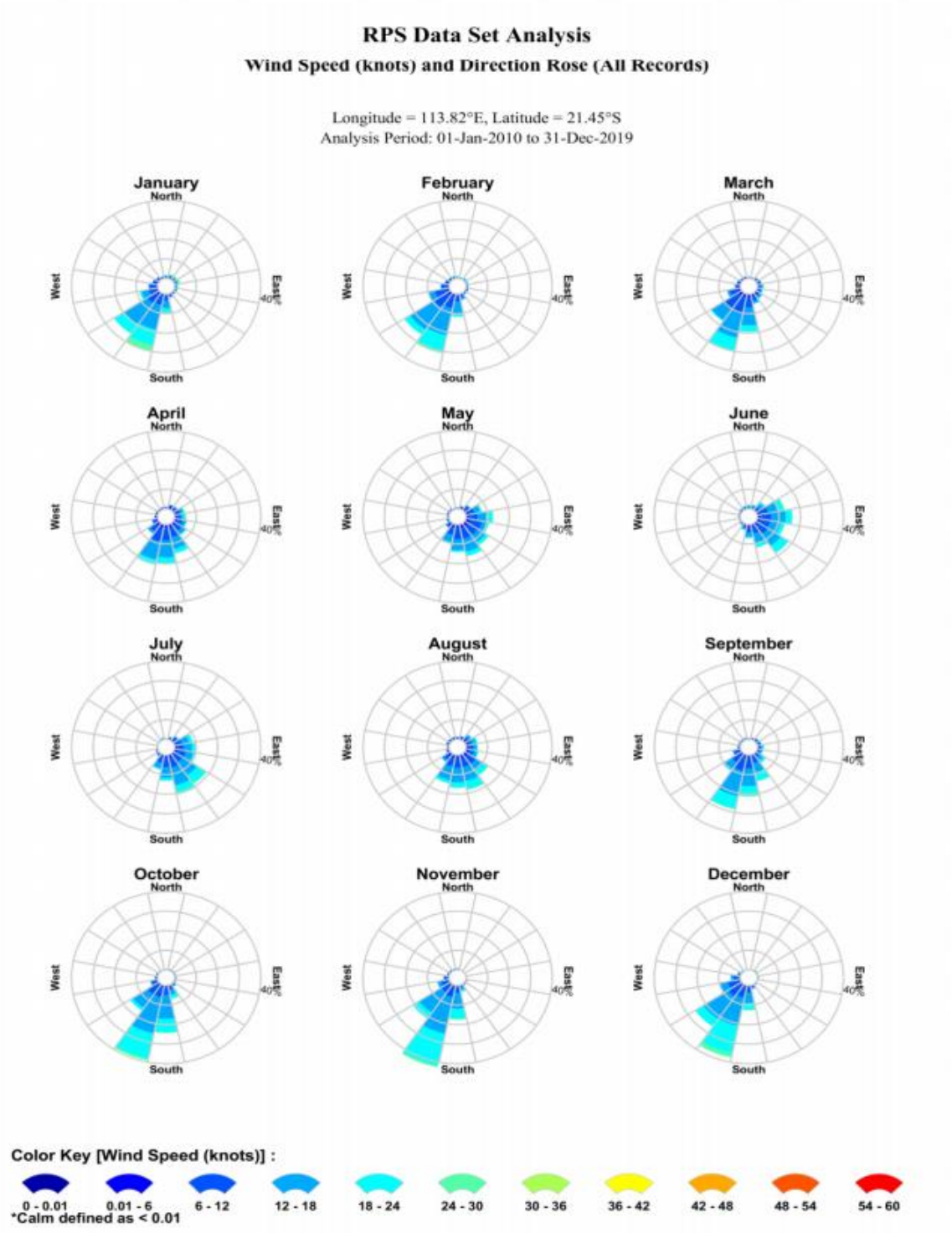


Figure 2-2: Monthly wind roses from the closest station to Exmouth (RPS, 2022)

2.2 OCEANIC CURRENTS

2.2.1 Currents and Tides

The oceanography within the EMBA is strongly influenced by the warm, low-salinity waters of the Indonesian Throughflow (ITF), which influences the upper 1,250 m of the water column (DEWHA, 2007). While the origin and movement of shelf waters such as those in the permit areas are not well understood, it is believed that the ITF waters flood the shelf via the Eastern Gyral Current and the Leeuwin Current (Figure 2-3). Surface currents are subject to strong seasonal variations; the Eastern Gyral Current intensifies during July to September and the Leeuwin Current is strongest in autumn and weakens from December to March.

Below the main thermocline, the water column is influenced by Banda Intermediate Water from the north, and Sub-Antarctic Mode Water and Antarctic Intermediate Water from the south (DEWHA, 2007). In addition to the major surface and subsurface currents, smaller localised currents also occur nearshore, such as the Capes, Ningaloo and Shark Bay Currents (Figure 2-3). In addition to seasonal variability, the oceanography of the region exhibits inter-annual variability, with winds driving the thermocline to shallower depths, reducing sea level and sea surface temperature, resulting in a weakening of the ITF and Leeuwin Currents during El Niño/Southern Oscillation and reversing in La Niña years (DEWHA, 2007). There is evidence of a strong northward current between 200 m, and 500 m in this area, which may be an offshoot of the Eastern Gyral Current (DEWHA, 2007).

Tides in the region are semi-diurnal (there are two high tides and two low tides each day). Spring tides (the highest tidal range each month) are about 1.6 m, while neap tides (the lowest tidal range) are about 0.6 m. The tides run on a northeast and southwest axis and the maximum speed of the tidal streams is about 0.5 m/sec. Wind-driven surface currents reflect the prevailing seasonal wind directions, which are predominately from the southwest during summer and from the east, southeast and south during winter (Figure 2-2). These prevailing winds generate surface currents of about 0.2 to 0.3 m/sec in the direction of the prevailing wind (Woodside, 2002).

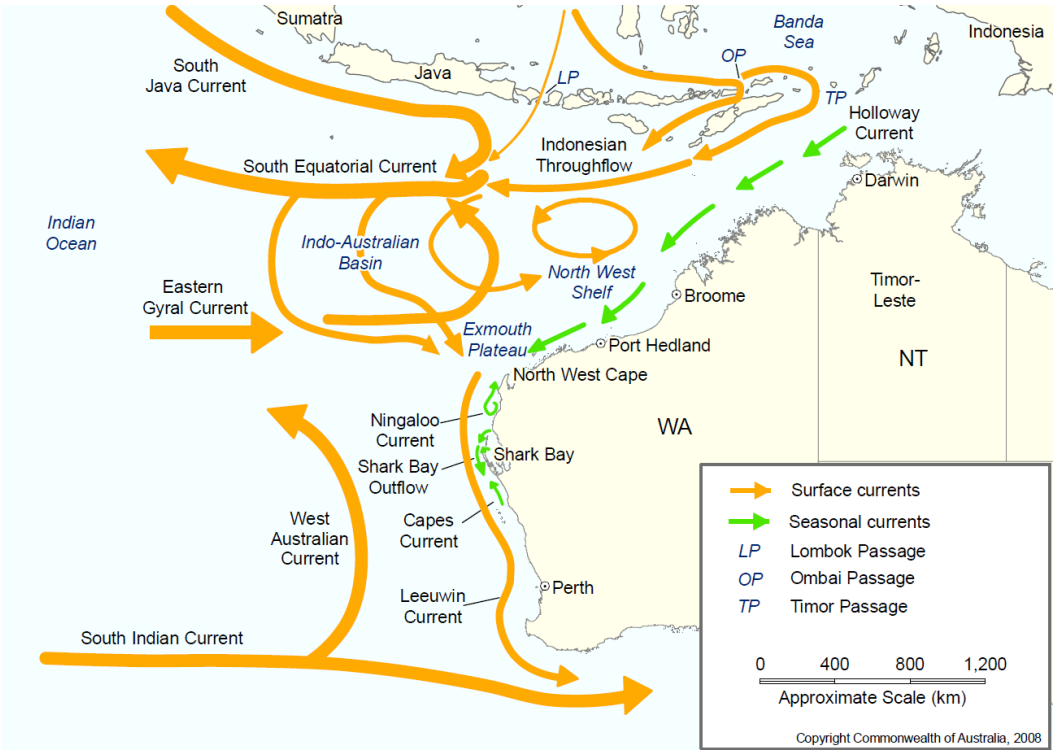


Figure 2-3: Oceanic currents present within the Indian Ocean and the western Australian coastline (DEWHA, 2007)

2.2.2 Waves

The wave regimes in the EMBA are caused by the combination of sea waves and swells. Sea waves occur predominantly from the southwest throughout the year, with more easterly waves experienced in winter, while the largest swells generally occur from June to October (Pearce et al., 2003; Woodside, 2002). Therefore, the largest total waves (sea waves combined with swell) occur from June to September, with April and May the calmest months, noting only 10% of significant wave heights off Dampier exceed 1.2 m, with average wave height being 0.7 m (Pearce et al., 2003). However tropical cyclones can generate extreme swells, generally from the northeast.

2.2.3 Water Temperature and Salinity

The average sea surface temperature within the operational area ranges from 22.9 °C (September) to 28.9 °C (March) (RPS, 2022). There is likely to be a distinct thermocline in deep offshore waters, associated with the warming influence of the Leeuwin Currents, which overlays colder, more saline, deeper ocean waters that vary seasonally (DEWHA, 2008). Salinity is relatively uniform at 35 parts per thousand.

Although the Leeuwin Current is a core movement of the EMBA region, it is overall dominated by the ITF. The ITF is one of the primary links in the global exchange of water and heat between ocean basins

and is an essential element in the global climate system. It delivers warm, oligotrophic (low in nutrients) and low-salinity ocean water from the western Pacific Ocean to the Indian Ocean and is a fundamental driver of oceanographic and ecological processes in the EMBA region (DEWHA, 2008).

2.2.4 Bathymetry and Geomorphology

The seafloor of the EMBA consists of four general feature types: continental shelf, continental slope, continental rise and abyssal plain (deep ocean floor). Most of the region consists of either continental slope or continental shelf. Seabed sediments are expected to compromise of bio-clastic, calcareous and organogenic sediments that were deposited by relatively slow and uniform sedimentation rates. The region is made up of a tropical carbonate shelf dominated by sand and gravel to 15° latitude, while the outer shelf/slope zone is dominated by mud (Baker et al., 2008). It has a relatively homogenous rise and abyssal plain/deep ocean floor that is dominated by non-carbonate mud because it occurs below the carbonate compensation depth (Baker et al., 2008).

Major contributors to sediment mobilisation on the continental shelf in the EMBA include storm events such as tropical cyclones, internal tides and ocean currents including the Leeuwin Current (Baker et al., 2008). Sediments of the middle shelf region are predominately influenced by tidal processes, including internal tides (Baker et al., 2008).

Seabed geomorphology is distinguished by notable topographic features, such as the Exmouth Plateau, terraces and canyons (including the Swan and Cape Range Canyons), as well as deep holes and valleys on the inner slope. The Montebello Trough occurs on the eastern side of the Exmouth Plateau and represents more than 90% of the area of troughs in the North-west Marine Region (Baker et al., 2008).

The Dirk Hartog Shelf varies in width from 40 km wide to the south of North West Cape, to approximately 7 km wide at Ningaloo Reef (Baker et al., 2008). It is relatively gently sloping and underlain by Pleistocene limestone or mudstone, occasionally exposed but mostly covered by a veneer of sediments of varying thickness. Where the sediment forms a thin layer over the base, the sediment veneer typically consists of coarser sands. Medium and fine sands interspersed with patches of coarser sands usually characterise the deeper sediments.

Approaching the coastline, the Dirk Hartog Shelf rises abruptly to the outer barrier reef, which consists of limestone and coral. The Ningaloo Reef comprises a partially dissected basement of Pleistocene marine or Aeolian sediments, or tertiary limestone covered by dead or living coral. The reef flat is on average several hundred metres wide (Marine Parks and Reserves Authority (MPRA) and Department of Conservation and Land Management (CALM), 2005) and separated from the coastline by a lagoonal area. Sediments in the lagoon are generally coarse calcareous sand with finer calcareous sand or silt

in deeper basins and gutters (MPRA and CALM, 2005). These longshore drainage channels skirt the shoreward edge of the reef and may be up to 12 m deep (MPRA and CALM, 2005). The underlying limestone may occasionally be exposed as bare pavement where the sand veneer has been swept away.

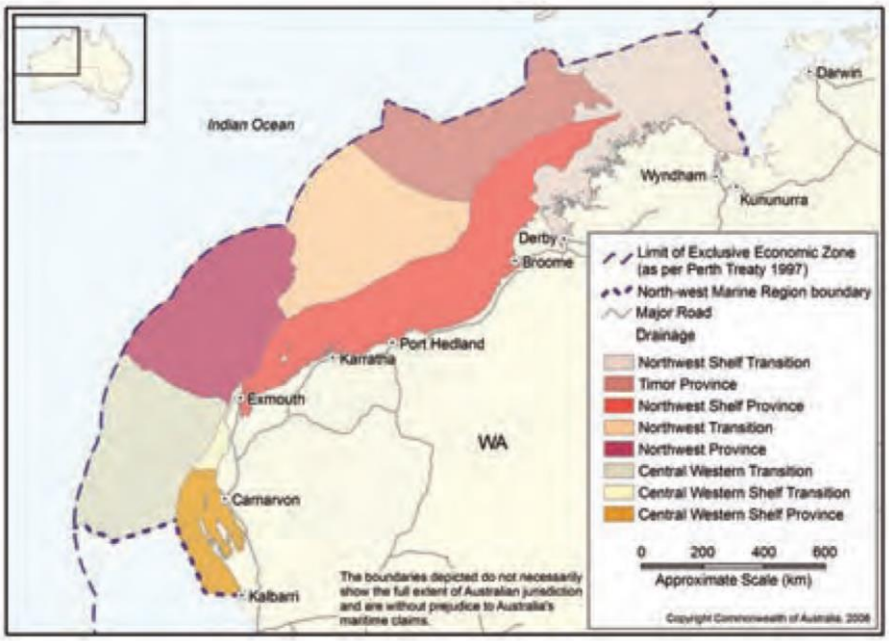
Continuing on from North West Cape, the Muiron Islands are low dome-shaped, limestone islands separated by a deep navigable channel. The continental shelf is much broader to the northeast of the Cape, sloping away from the Muiron Islands to the shelf break some 30 km seaward. The western shores of the islands are characterised by limestone cliffs fronted by sandy beaches, reef flats and intertidal limestone pavements and rubble deposits. The eastern shores of the islands comprise sandy beaches backed by low dunes. They have gently sloping subtidal sand with patch reefs and coral bommies, eventually levelling out to muddy, soft substrata.

3 BIOLOGICAL ENVIRONMENT

3.1 BIOREGIONAL CONTEXT

The Operational area is situated within the Northwest Province, as defined in the Northwest Marine Bioregional Plan (DEWHA, 2008). Figure 3-1 illustrates this marine region and bioregions. This region covers an area of 178,651 km^2, from the north-west Cape to west of the shelf break. The area largely consists of benthic features such as the Exmouth Plateau, continental slopes and canyons in waters depths of between 1,000 to 3,000 m.

A



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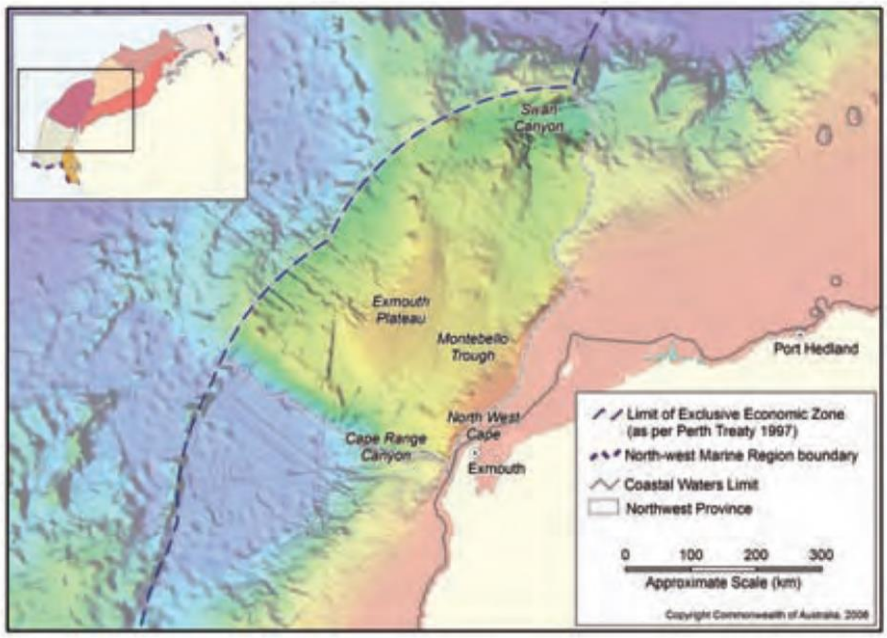

Figure 3-1: A) Bioregions of the Northwest Marine Region, and B) Location of the North West Province (taken from DEWHA, 2008)

3.2 MARINE BENTHIC HABITATS

3.2.1 Deep-water Benthic Habitats

The EMBA falls within the outer shelf, continental slope, and deep ocean. The continental slope and shelf are, for the most part, ecosystems built on a soft sediment habitat with gradational variation in

species composition due to depth, water temperature, light penetration, and sediment composition/structure. It consists of generally sparse populations of sessile filter feeders (e.g., sponges, soft corals etc.), infauna, and a mobile epibiota (e.g., crustaceans, echinoderms, and molluscs).

Sea floor communities in deeper shelf waters receive insufficient light to sustain ecologically sensitive primary producers such as seagrasses, macroalgae or reef-building corals. Given the depth of water at the operational area (approximately 810-850 m), these benthic primary producer groups will not occur in the operational area but are present in shallower waters within the wider region. Pelagic fish species occur in the deeper offshore waters of the region, including billfish, sailfish, marlin, and swordfish. Pelagic fish species are seasonally abundant and may pass through the area during annual migrations.

Demersal fish assemblages in relatively deep continental slope and deep ocean habitat also occur, although typically in much lower

3.2.2 Shallow Water Benthic Habitats

Water depths in the Operational Area are approximately 1,100 m to 1,200 m, which is too deep to support benthic primary producers, such as macroalgae, seagrasses and zooxanthellate corals. These habitats are typically restricted to relatively shallow water (< 50 m) and occur widely in the inner continental shelf in the region.

The distribution of shallow water and coastal benthic habitats of the Ningaloo Reef is well understood. Perhaps the most comprehensive study of habitats of Ningaloo Reef is the work conducted by the Ningaloo Collaboration Cluster (Kobryn et al., 2013), funded in part by BHP, to provide a highly resolved classification of benthic habitats associated with the reef and coastal shallow waters. Habitat characterisation showed most (54%) of the benthic cover is composed of macroalgal and turfing algae communities, while hard and soft coral cover represents only 7% of the mapped area (762 km^2). There were 5,854 ha of coral mosaics mapped along the Ningaloo Reef. The single largest coral mosaic type was continuous tabulate coral (2,155 ha or 37% of all corals). Most of the coral classes (66%) were a mix of dense to continuous tabulate coral, sparse digitate coral, soft coral and sparse sub-massive and massive corals. Continuous to patchy digitate and tabulate coral made up to 10% of the coral cover, while branching Acropora was around 8.5%. Most of the hard coral occurred as either very dense (continuous >90%) cover or as patchy distribution (20 to 45%). Around 15,200 ha (21%) of the mapped habitats were close to shore (0 to 500 m).

3.2.3 Coral Reefs

The EMBA overlaps several areas which would contain extensive coral communities including the Ningaloo Marine Park. The Ningaloo Coast is approximately 180 km southeast of the Operational Area.

Corals are both primary producers and filter feeders and thus play a role in providing food to marine fauna and in recycling nutrients to support ecosystem functioning (MPRA and CALM, 2005). Corals create settlement substrate and shelter for marine flora and fauna. Studies have shown declines in the abundance, or even marked changes in species composition of corals, have a marked impact on the biodiversity and productivity of coral reef habitats (Pratchett et al., 2008).

Coral within this region can be categorises into three general groups, being:

- Scleractinian corals (hard corals) – reef building corals
- Non-scleractinian corals (often referred to as calcified soft corals) – generally not considered to be reef-building
- Soft corals belonging to the Order Alcyconacea (soft corals) – non-reef building corals

The distribution of corals is governed by the availability of hard substrate for attachment and light-availability. Hard habitats, such as limestone pavements of the NWS and reefs on the edge of the shelf and offshore islands, support coral reef systems. Particularly, the coral reef system of Ningaloo is globally significant as it is the only extensive coral reef in the world that fringes the west coast of a continent (Department of Sustainability, Environment, Water, Population and Communities, 2012). As part of the reef-building process, scleractinian corals are also important for protecting coastlines through accumulating and cementing sediments and dissipating wave energy (MPRA and CALM, 2005).

Coral reefs are dynamic environments that regularly undergo cycles of disturbance and recovery. Depending on how frequent and severe the disturbances are, recovery can take a few years or more than a decade. Disturbances can include sedimentation, cyclones and disease outbreaks (Haapkylä et al., 2013). Coral susceptibility to bleaching and their ability to recover is an important consideration in the context of potential anthropogenic impacts.
In Western Australia, 318 species of scleractinian corals from 70 genera have been recorded. Of these, 53 genera and more than 250 different species of coral have been recorded so far on Ningaloo Reef, including representatives from all 15 families of corals dominated by Acroporidae and Faviidae (Veron and Marsh, 1988).

Reef-building corals are the most visible and identifiable component of coral reef ecosystems. Smaller coral communities tend to form in the region wherever a hard substratum is available. Reef-building corals are generally restricted to the upper photic zone due to the dependence of their unicellular endosymbionts (commonly known as zooxanthellae) on light. This in turn drives photosynthesis, providing reef-building corals with most of their energy requirements (Muscatine, 1990). Consequently, most coral habitat is present in shallow water, particularly on subtidal platforms that border most of the mainland and islands.

Each year, most of the corals on the reef undergo one or two mass synchronous spawning events. These spawning events usually happen over three or four nights in March and April, during the evening neap tide seven to ten days after the full moon (Simpson et al., 1993). There may also be smaller synchronous spawning events during other times of the year. Coincident with these events, large swarms of krill have been detected in the shallow coastal waters offshore from Ningaloo Reef from March to June.

The hyperspectral data collected via Kobryn et al. (2013) (125 spectral bands between 450 to 2,500 nm and an average spectral resolution of 15 nm) was acquired in 2006 at 3.5 m ground resolution. The total area of the survey covered 3,400 km^2, encompassing Ningaloo Reef to a depth of around 20 m, as well as the coastal strip adjacent to the Ningaloo Marine Park. There were 5,854 ha of coral mosaics mapped along the Ningaloo Reef. The single largest coral mosaic type was continuous tabulate coral (2,155 ha or 37% of all corals). Most coral classes (66%) were a mix of dense to continuous tabulate coral, sparse digitate coral, soft coral and sparse sub-massive and massive corals. Continuous to patchy digitate and tabulate coral made up around10% of the coral cover, while the branching coral species Acropora was around 8.5%. Most of the hard coral occurred as either very dense (continuous >90%) cover or as patchy distribution (20 to 45%). Around15,200 ha (21%) of the mapped habitats were close to the shore (0 to 500 m).

This dataset represents an unprecedented baseline dataset, with a spatial extent that spans about 300 km from Bundegi in the north to Red Bluff in the south and includes the Muiron Islands.

Ningaloo Reef and the reefs around the coasts support many habitats, including:

- The outer reef slope is relatively short and steep, extending from sea level to about 10 m depth. It may be undercut or extend seaward into a series of spurs and grooves, often supporting a rich coral growth. The fore reef community is highly diverse with live coral cover over the sloping spur and groove reef.
- The reef crest or outer reef rim is the highest part of the reef and thus most frequently exposed on low tides. It occurs as a narrow band only a few metres wide and distinguishable because of its height. There are occasional reef passes (deep channels), which allow the exchange of seawater and provide access to the lagoon for larger fauna on low tides. Reef crests, which have variable coral cover, are dominated by digitate *Acropora* and massive forms of *Goniastrea* and *Platygyra.*
- The reef flat is the extensive shallow area located on the shoreward side of the crest. At Ningaloo, it may be several hundred metres wide. Live corals occur throughout this area but do not frequently form a total cover, due to frequent storm damage and other natural perturbations. The living coral overlies recently dead corals superimposed on Pleistocene aeolian and marine

limestone/sandstone deposits. Reef flats have varying cover of rubble deposits and live coral, and sand can be a dominant feature of this area (such as evidenced by the extensive sand areas in the northern section of the Yardie Creek region and adjacent to Point Cloates).

- There is an extensive lagoon system inside Ningaloo Reef from along the western side of the North West Cape. Different habitats in the lagoons include coral bommies, exposed rocky and sandy seabeds, and deep holes and channels. The more stable sandy bottoms provide suitable habitats for seagrasses and macroalgae.

3.2.4 Macroalgae Beds

Macroalgae are large, visible plants such as kelp, typically attached to hard substrata such as intertidal and subtidal rock platforms, limestone reefs, rock/rubble areas and dead or partially dead corals, typically in water depths less than 10 m, but can occur in up to about 50 m (LeProvost Dames & Moore, 2000). Macroalgae are divided into three groups: Phaeophyceae (brown algae), Rhodophyta (red algae) and Chlorophyta (green algae). Macroalgal communities occur predominantly in the intertidal and subtidal waters of the region (up to depths of about 50 m), including limestone pavements, reefs and platforms, coral rubble and dead or partially dead corals (LeProvost Dames & Moore, 2000). *Ecklonia radiata* and *Sargassum* sp. are typically common in deeper areas.

The principal physical factors affecting the presence and growth of macroalgae include temperature, nutrients, water motion, light, salinity, substratum, sedimentation, and pollution (Sanderson, 1997). They occur in moderate to high cover on exposed hard substrates, but typically have lower cover on hard substrates that have a veneer of sediment (SKM, 2009). Macroalgae exhibit very high seasonal and inter-annual variation in biomass (Heyward et al., 2006), distribution, abundance and biodiversity (BHPIO, 2011). The distribution of hard substrates therefore indicates areas that may support macroalgal communities, although abundance and diversity may fluctuate annually.

Macroalgae are susceptible to disturbance from factors such as sedimentation, scouring and turbidity but the marked seasonality in biomass, abundance, diversity and distribution suggests macroalgae are likely to be resilient to acute, short-term disturbance acting at local scales. Macroalgae may be more susceptible to impacts acting over longer time scales (years) and at certain times of the year, where recruitment at a regional scale could be affected. Indirect impacts affecting the numbers, distribution and community structure of herbivorous fish can also be expected to have impacts (either positive or negative) on macroalgal habitats (Vergès et al., 2011).

Brown algae (Phaeophyte) and red algae species such as Sargassum and Dictyotales tend to dominate the macroalgal communities in terms of biomass and abundance. Macroalgal communities are ecologically important, being highly productive and providing complex habitat for invertebrates, cryptic

fish and juvenile fish of various species, and a direct food source for many species such as green turtles.

Beds of macroalgae, along with seagrass (see below), provide a major source of benthic production in coastal waters, and support a benthic invertebrate faunal community of high diversity and abundance. Macroalgal beds also provide a complex habitat for cryptic fish and juvenile fish of various species, and a direct food source for many species such as green turtles. Large beds of macroalgae are known to occur around the Muiron Islands and on the eastern side of Exmouth Gulf (McCook et al., 1995). Well-developed macroalgal communities also occur extensively along the Ningaloo Reef tract.

3.2.5 Seagrass

Seagrasses are highly productive habitats that occur on intertidal flats and in shallow coastal waters worldwide, from Arctic to tropical climates. Seagrass generally grows in soft sediments within intertidal and shallow subtidal waters, where there is sufficient light, and are common in sheltered coastal areas such as bays, lees of islands and fringing coastal reefs (McClatchie et al., 2006; McLeay et al., 2003). Water temperature, light penetration, sediment type, salinity, and wave or current energy control seagrass distribution.

Twenty-five species of seagrass have been recorded in WA, the highest diversity in the world (Masini et al., 2009). Waters extending from Busselton to the NT border support predominantly tropical species, although temperate species are also found, particularly between Busselton and Exmouth (Walker et al., 1987). One species, Cymodocea angustata, is endemic to WA.

Areas occupied by seagrass exhibit marked seasonal and interannual variability and it is not clear why some areas of suitable substrate will support seagrass in one year but not the next. It appears recruitment to what may otherwise be suitable substrate is haphazard, lending weight to the description of these seagrass communities as ephemeral (MPRA and CALM, 2005).

Seven different species have been recorded in the region, of which Halophila ovalis is the most common of the seagrasses found on the western side of Exmouth Gulf. It is a tropical species and, although widespread throughout the Ningaloo Reef and Rowley Shelf region, it is usually restricted to sparse and patchy occurrences. Seagrasses, including Halophila, are eaten by dugongs and also provide a complex habitat for juvenile fish and invertebrates of various species, and are therefore ecologically important.

3.2.6 Other Benthic Invertebrates

The offshore marine environment from Busselton to the NT border is dominated by soft sediment seabeds; sandy and muddy substrates, occasionally interspersed with hard substrates covered with sand veneers; and rarely-exposed hard substrate. In shallow waters, non-coral benthic invertebrates

may form part of the mosaic of benthic organisms found on hard substrates, alongside macrophytes and coral colonies. As light reduces with water depth, non-coral benthic invertebrates are the dominant community, albeit at low densities.

Benthic invertebrates comprise several types of feeding groups, including deposit feeders, filter feeders, grazers and predators. The abundance, diversity, biomass and species composition of benthic invertebrates can be used as indicators of changing environmental conditions. The distribution and abundance of benthic invertebrate species may be influenced by a wide variety of physical parameters, such as substrate composition, water temperature, depth, dissolved oxygen concentrations, pH, salinity, sediment C/N ratios and hydrography. Spatial and temporal differences in benthic species composition may also be influenced by a range of biological factors, such as primary productivity, competition and acclimatisation. Natural seasonal and interannual changes in these variables can also modify recruitment success and mortalities of individual species, and consequently the community structure of the benthos (OzCoasts, 2020).

3.3 SHORELINE HABITAT

The Operational Area and the EMBA do not overlap any shoreline habitats such as mangroves, sandy beaches, rocky shores or wetlands. At its closest, the EMBA is approximately 14 km from the nearest shoreline.

3.4 PELAGIC ENVIRONMENTS

3.4.1 Plankton

Plankton consists of microscopic organisms typically divided into phytoplankton (algae) and zooplankton (fauna including larvae). Planktons play a major role in the trophic system, with phytoplankton being a primary producer and zooplankton a primary consumer. They are both in turn consumed by other fauna species.

Phytoplankton are autotrophic planktonic organisms living within the photic zone and spend either part or all of their lifecycle drifting with the ocean currents. Phytoplankton depend on oceanographic processes, such as currents and vertical mixing, that supply nutrients needed for photosynthesis. Thus, phytoplankton biomass is typically variable (spatially and temporally) (Evans et al., 2016) but greatest in areas of upwelling, or in shallow waters where nutrient levels are high. Peak primary productivity, however, varies on a local and regional scale.

The trophic system in the pelagic zone of the NWMR is based on phytoplankton (DEWHA, 2008). The distribution of plankton is often associated with localised and seasonal productivity that results in sporadic bursts of phytoplankton and zooplankton communities (DEWHA, 2008). However, in general,

the mixing of warm surface water with deeper, more nutrient-rich water generates phytoplankton production and zooplankton blooms.

Cyclones can influence the distribution and abundance of plankton. Observations of Cyclone Tiffany, which affected the NWS in January 1988, noted that communities of phytoplankton rapidly recovered as a result of changed nutrient conditions, while zooplankton species were transported into areas beyond their normal range due to changes in current, wind and wave patterns (DEHWA, 2008).

3.4.2 Fish

Some 1,400 species of finfish are known to occur in the region, mostly of a tropical Indo-West Pacific affinity, with a greater proportion occurring in shallow coastal waters (DEWHA, 2008). In general, most fish in the region are associated with coral reefs. For example, the abundance, species richness and assemblage structure of juvenile fishes was quantified in 2009 to 2011 at 20 locations extending from Bundegi to 3-Mile Camp and covering around 280 km of the Ningaloo coastline. Sampling included back reef and lagoonal reef zones as well as sanctuary and recreational management zones. In total, 36,791 juvenile fishes from 120 species were observed over the three recruitment years, providing an average of 53 individuals (± 2.6 standard error) per 30 m^2 transect.

Interestingly, recruitment rates varied significantly among sampling times (in other words, temporal variation). Transect abundance means ranged from 82 ± 6.3 individuals (2009), 19 ± 1.2 individuals (2010) to 77 ± 4.6 individuals (Depczynski et al., 2011). The authors of this study noted the 75% drop in abundance in 2010 coincided with a small increase in mean species richness. Different pelagic fish occur in the deeper offshore waters of the region. Pelagic fish species are seasonally abundant and may pass through the area during annual migrations. The most notable species of deep-water pelagic fishes in the area are the billfish, which include sailfish, marlin (both family *Istiophoridae*) and swordfish (*Xiphias gladius*).

The region also supports diverse and abundant shark and ray populations. Whaler sharks (Family

Carcharhinidae) are the most numerous and diverse, occurring in a wide range of habitats such as intertidal (black-tip reef shark – *Carcharhinus melanopterus*), offshore reefs (grey reef shark – *C. amblyrhynchos*) and deep ocean areas (oceanic white-tip shark – *C. longimanus*).

The Ningaloo Marine Park (State Waters) Management Plan 2005–2015 (MPRA and CALM, 2005) outlines a suite of management strategies to protect marine plants and animals found in the region. The offshore waters of the Ningaloo Reef and Muiron islands have diverse and abundant shark and ray populations. Section 7.1.14 of the Ningaloo Marine Park (State Waters) Management Plan 2005–2015 references several locations in the Ningaloo Marine Park, including Pelican Point, Bundegi Sanctuary Zone, Mangrove Bay and Bills Bay, which are suggested aggregation points (nursery areas) for juvenile

sharks and ray populations. The best known of these is Bills Bay, where up to 100 sharks have been witnessed in water depths as shallow as 0.5 m. Aggregations recorded in other locations of the reserves have so far represented fewer individuals. Due to stable diversity and abundance of shark and ray numbers, there is presently a low level of threat to these populations. The current major pressure is from commercial and recreational fishing; however, population information is limited.

3.5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

3.5.1 Overview

Searches of the Protected Matters Database were undertaken for the EMBA identified for the Activity to identify the potential protected species, habitats and areas listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that may occur within this area; this Section details all sensitivities identified in the reports.

3.5.2 World Heritage Properties

World Heritage Properties represent the best examples of the world's cultural and natural heritage. There are no World Heritage Properties within the Operational Area. The EMBA intercepts the boundary of one World Heritage Property: the Ningaloo Coast.

3.5.2.1 Ningaloo Coast

The Ningaloo Coast was included on the World Heritage List in June 2011 for its natural beauty, aesthetic importance and significant habitats of biological diversity containing threatened species. Located on WA's remote coast along the East Indian Ocean, it covers an area of 6045 km² and includes one of the longest nearshore reefs in the world (UNESCO, 2020). The Ningaloo Coast World Heritage Area comprises the Ningaloo Marine Park (State waters and the adjoining Commonwealth waters section), the Muiron Islands Marine Management Area and Nature Reserve, the Bundegi and Jurabi coastal parks and the Cape Range National Park, in addition to Crown leasehold and freehold land. The values recognised by the World Heritage listing are:

- Landscapes and seascapes of the property compromise mostly intact and large scale marine and terrestrial environments
- Whale shark aggregations follow the mass coral spawning and seasonal upwelling each autumn at Ningaloo Reef, one of the few places in the world where this species congregates
- It forms part of the annual migration route for whales and turtle species
- Marine turtle density is exceptionally high, with green turtles being the most abundant
- The Ningaloo Coast is on the migratory route for many trans-equatorial wader bird species and provides feeding grounds for many migratory seabirds

- More than 300 coral species and 155 species of sponges have been documented
- More than 700 species of reef fish and more than 650 species of molluscs are present
- There are 600 species of crustaceans
- A high diversity of echinoderms are present, including 25 new species

3.5.3 National Heritage Properties

There are 13 National Heritage Places located in WA, of which none are in the Operational Area. One National Heritage Property lies within the boundaries of the EMBA: the Ningaloo Coast

3.5.3.1 Ningaloo Coast

The Ningaloo Coast was included in the National Heritage List in May 2007, refer to Section 3.5.2.1.

3.5.4 Commonwealth Marine Reserves

One Commonwealth Marine Reserve intersects the EMBA. There are no Commonwealth Marine Reserves within the Operational Area.

The EMBA intersects the Multi-use zone (IUCN category VI) of the Gascoyne Commonwealth Marine Reserve. This category is described as:

“Protected areas that conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area” (IUCN, 2012). A description of this reserve is detailed in Table 3-1.

Table 3-1: Key features of the Gascoyne Commonwealth Marine Reserve

Commonwealth Marine Parks & Marine Management Areas	Key Features
Gascoyne Commonwealth Marine Reserve	• Important foraging area for migratory seabirds, turtles and the whale shark. • A continuous connectivity corridor from shallow depths around 15 m out to deep offshore waters on the abyssal plain at over 5,000 m in depth. • Seafloor features including canyon, terrace, ridge, knolls, deep hole/valley and continental rise. It also provides protection for sponge gardens in the south of the reserve adjacent to Western Australian coastal waters.

	• Ecosystems examples from the Central Western Shelf Transition, the Central Western Transition and the Northwest province provincial bioregions as well as the Ningaloo meso-scale bioregion. • The canyons in this reserve are believed to be associated with the movement of nutrients from deep water over the Cuvier Abyssal Plain onto the slope where mixing with overlying water layers occurs at the canyon heads. These canyon heads, including that of Cloates Canyon, are sites of species aggregation and are thought to play a significant role in maintaining the ecosystems and biodiversity associated with the adjacent Ningaloo Reef. • The reserve therefore provides connectivity between the inshore waters of the existing Ningaloo Commonwealth marine park and the deeper waters of the area.

Reserve Management Requirements	
Reserve Management Principle[1]	**Activity Consistent with Principle?**
7.01 The reserve or zone should be managed mainly for the sustainable use of natural ecosystems based on the following principles	**Yes -** Activity consistent with the following principles as outlined below
7.02 The biological diversity and other natural values of the reserve or zone should be protected and maintained in the long term.	**Yes -** EP describes how activities with the potential to impact natural values of the reserve will be managed – no significant impacts to biodiversity or other values of the reserve predicted
7.03 Management practices should be applied to ensure ecologically sustainable use of the reserve or zone.	**Yes -** EP describes how activities that may occur within the reserve (i.e. spill response) will be managed
7.04 Management of the reserve or zone should contribute to regional and national development to the extent that this is consistent with these principles.	**Yes -** Petroleum development a significant contributor to regional and national development

Note: [1] Australian IUCN reserve management principles, as relevant under transitional management arrangements

3.5.5 Wetlands of International Importance

No Wetlands of International Importance were identified within the EMBA or the Operational Area.

3.5.6 Protected Species and Communities

Protected species and communities listed as a MNES are discussed in Section 3.6.

3.5.7 Key Ecological Features

Four Key Ecological Features (KEFs) intersects both the Operational Area and the spill EMBA.

3.5.7.1 Exmouth Plateau

The Exmouth Plateau is a regionally and nationally unique tropical deep-sea plateau. It may serve an important ecological role by acting as a topographic obstacle that modifies the flow of deep waters which generate internal tides, causing upwelling of deeper water nutrients closer to the surface (Brewer *et al*. 2007).

3.5.7.2 Continental Slope Demersal Fish Communities

This species assemblage is recognised as a KEF because of its biodiversity values, including high levels of endemism. The diversity of demersal fish assemblages on the continental slope in the Timor Province, the Northwest Transition and the Northwest Province is high compared to elsewhere along the continental slope. The continental slope between North West Cape and the Montebello Trough has more than 500 fish species, 76 of which are endemic, making it the most diverse slope bioregion in Australia. The demersal fish species occupy two distinct demersal community types associated with the upper slope (water depth of 225 to 500 m) and the mid slope (750 to 1000 m).

3.5.7.3 Canyons linking to the Cuvier Abyssal Plain and the Cape Range Peninsula

This KEF is recognised for its biodiversity values (unique sea-floor feature with ecological properties of regional significance), which apply to both the benthic and pelagic habitats within the KEF. The canyons are associated with upwelling as they channel deep water from the Cuvier Abyssal Plain onto the slope. This nutrient-rich and cooler water interacts with the Leeuwin Current at the canyon heads. Thus, the canyons probably play a part in the enhanced productivity of the Ningaloo Reef system.

3.5.7.4 Ancient Coastline at 125 m depth contour

This KEF is recognised for its biodiversity values (unique seafloor feature with ecological properties of regional significance), which apply to both the benthic and pelagic habitats within the KEF. The shelf of the NWMR contains several terraces and steps that reflect increases in sea level across the shelf that occurred during the Holocene period. The most prominent of these occurs episodically as an escarpment through the North West Shelf Province and the North West Shelf Transition, at a depth of around 125 m.

Parts of the ancient coastline, particularly where it exists as a rocky escarpment, are thought to provide biologically important habitats in areas otherwise dominated by soft sediments. Little is known about fauna associated with the hard substrate of the escarpment, but it is likely to include sponges, corals, crinoids, molluscs, echinoderms and other benthic invertebrates representative of hard substrate fauna in the NWS bioregion.

The topographic complexity of the escarpment may also facilitate vertical mixing of the water column, providing relatively nutrient-rich local environments. Enhanced productivity may also attract opportunistic feeding by larger marine life including humpback whales, whale sharks and large pelagic fish

3.5.7.5 Commonwealth Waters adjacent to Ningaloo Reef

This KEF is recognised for its biodiversity (aggregations of marine life) values, which apply to both the benthic and pelagic habitats within the KEF. The Commonwealth waters adjacent to Ningaloo Reef include Ningaloo Marine Park (Commonwealth waters) covering an area of 2435 km². This feature lies adjacent to the Ningaloo Reef State waters margin at the 3 nm limit. Ningaloo Reef is globally significant as the only extensive coral reef in the world that fringes the west coast of a continent. Upwellings associated with canyons on the adjacent slope and interactions between the Ningaloo and Leeuwin currents result in areas of enhanced productivity in the Commonwealth waters adjacent to Ningaloo Reef

3.6 BIOLOGICALLY IMPORTANT AREAS

The DCCEEW's National Conservation Atlas identifies areas that are considered to be important for the conservation of protected species and where aggregations of individuals display biologically important behaviour such as breeding, foraging, resting or migration. The Marine Bioregional Plan for the North-west Marine Region provides advice on rating potential risk to BIAs while noting that "biologically important areas are not protected matters and should not be confused with 'critical habitat' as defined in the EPBC Act."

A review of the Atlas indicates that a BIA for pygmy blue whale migration occurs across the Operational Area and EMBA.

3.6.1 Species Recovery Plans, Conservations Atlas and Threat Abatement Plans

Table 3-4 of the EP provides the EPBC Act listed threatened and migratory species that may occur within the Operational Area and EMBA. Of those, a number have Recovery Plans, Conservation Management Plans or approved Conservation Advice in place (Table 3-2, below).

Recovery Plans set out the research and management actions necessary to stop the decline of, and support the recovery of listed threatened species. In addition, Threat Abatement Plans provide for the research, management, and any other actions necessary to reduce the impact of a listed key threatening process on native species and ecological communities. The Minister decides whether a threat abatement plan is required for key threatening processes listed under Section 183 of the EPBC Act.

Table 3-2 provides information on the specific requirements of the relevant conservation advice, species recovery plans and threat abatement plans that is applicable to the Activity, and demonstrates how current management requirements have been taken into account during the preparation of the EP. Through the implementation of relevant control measures, performance outcomes and performance standards, potential risks and impacts of the Activity are managed to ALARP and acceptable levels.

Table 3-2: Summary of relevant Species Recovery Plans, approved Conservation Plan and Threat Abatement Plans

Species	Relevant Plan/Conservation Advice	Summary and Relevance to the EP
Fish		
Great white shark	Recovery Plan for the White Shark (DSEWPaC, 2013).	• The great white shark may occur within the Operational Area and spill EMBA. • The Recovery Plan considers habitat critical to the survival of the species as nursery, pupping, foraging/feeding and migration areas. Important habitats for the species are identified and mapped as BIAs. Although there are no BIAs for the great white shark within either area, the species occurs along the length of the WA coastline and undertakes pelagic and offshore movements; as such, is likely to transit through. • The Recovery Plan lists a number of threats to the species in Australian waters. Threats potentially applicable to the Activity are habitat modification. The Activity is not predicted to hinder the recovery or impact on the conservation status of the species.
Marine Mammals		
Sei whale	Approved Conservation Advice (TSSC, 2015a)	• The sei whale may occur within the Operational Area and spill EMBA. • The Conservation Advice lists a number of threats to the species in Australian waters. Threats applicable to the Activity are vessel strike, anthropogenic noise and acoustic disturbance. • This EP assesses potential impacts and risks to whales from noise emissions and vessel strike in Section 5 and Section 6 of the EP, respectively. As part of Western Gas's reporting requirements for the Activity (refer to Section 9.6 of the EP), any vessel strikes with cetaceans will be reported in the National Ship Strike Database.
Blue whale	Conservation Management Plan (Recovery Plan) for the Blue Whale (DoE, 2015)	• Pygmy blue whales may occur in the Operational Area and spill EMBA. • The Recovery Plan identifies anthropogenic threats that may inhibit the recovery of the populations in Australian waters. Those potential threats that are applicable to the Activity are noise interference (e.g. vessel noise), vessel disturbance (e.g. physical presence and strike) and marine pollution (e.g. unplanned releases of materials and objects). This EP assesses potential impacts and risks to whales from noise emissions, solid wastes, unplanned interference with marine fauna (physical presence and vessel strike with marine fauna), and various unplanned materials/object releases Sections 5 and 6 of the EP. As part of Western Gas's reporting requirements for the Activity (refer to Section 8.7), any vessel strikes with cetaceans will be reported in the National Ship Strike Database.

Fin whale	Approved Conservation Advice (TSSC, 2015b)	• The fin whale may occur within the Operational Area and spill EMBA. • The Conservation Advice lists a number of threats to the species in Australian waters. Threats applicable to the Activity are vessel strike and anthropogenic noise. This EP assesses potential impacts and risks to whales from noise emissions and vessel strike in Section 5 and 6 of the EP, respectively. As part of Western Gas's reporting requirements for the Activity (refer to Section 9.6 of the EP), any vessel strikes with cetaceans will be reported in the National Ship Strike Database.
Humpback whale	Approved Conservation Advice (TSSC, 2015c)	• The humpback whale may occur in the Operational Area and spill EMBA. • The Approved Conservation Advice lists a number of threats to the species in Australian waters. Threats applicable to the Activity are anthropogenic noise sources (e.g. ship-sourced noise), impacts from vessel presence and strike, and entanglement from marine debris (e.g. plastic garbage and non-biodegradable floating materials lost at sea). This EP assesses potential impacts and risks from noise pollution, solid wastes, and vessel strike in Sections 5 and 6 in the EP, respectively. As part of Western Gas's reporting requirements for the Activity (refer to Section 9.6 of the EP), any vessel strikes with cetaceans will be reported in the National Ship Strike Database.
EPBC Act listed cetacean and other mammal species identified as occurring in the Operational Area and spill EMBA at risk of being adversely impacted by marine debris: • Sei whale • Blue whale • Fin whale • Humpback whale • Bryde's whale	Draft Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life (DotEE, 2017)	• The threat abatement plan is being revised and the draft plan is currently released for public comment. • The plan recognises harmful marine debris includes ship-sourced, solid non-biodegradable material disposed of at sea is a risk to vertebrate marine life through entanglement or ingestion. The plan includes an appendix of EPBC Act listed species at risk of being impacted by marine debris. Of those species listed in the draft plan, five have been identified as potentially occurring within the Operational Area and spill EMBA. The EP assesses potential impacts and risks from solid waste discharges (Section 5 and 6 of the EP).
Marine Reptiles		
Loggerhead turtle Green turtle Hawksbill turtle	Recovery Plan for Marine Turtles in Australia (DoEE, 2017b)	• The Recovery Plan lists a number of threats to turtle species in Australian waters and identifies that the risks posed by these threats vary depending on the habitats, timing of habitat occupancy, life cycle stage affected, abundance and trends in nesting and foraging numbers and the management/mitigation currently in place.

Leatherback turtle Flatback turtle		• The Plan identifies habitats critical to nesting and internesting behaviours of turtles – none of these occur in or in proximity of the EMBA. • Identified threats potentially applicable to the Activity are marine debris, chemical discharge, light pollution, vessel disturbance and noise interference. • The management proposed for the Activity is consistent with the Actions identified to address relevant threats Potential risks and impacts to marine turtles from the Activity are assessed in the EP.
EPBC Act listed marine turtle species identified as occurring in the Operations Area at risk of being adversely impacted by marine debris: • Flatback turtle • Green turtle • Hawksbill turtle • Leatherback turtle • Loggerhead turtle	Draft Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life (DoEE, 2017)	• The threat abatement plan is being revised and the draft plan is currently released for public comment. • The plan recognises harmful marine debris includes ship-sourced, solid non-biodegradable material disposed of at sea is a risk to vertebrate marine life through entanglement or ingestion. The plan includes an appendix of EPBC Act listed species at risk of being impacted by marine debris. Of those species listed in the draft plan, five marine turtles have been identified as potentially occur within the Operational Area and spill EMBA. The EP assesses potential impacts and risks from solid waste discharges (Section 5 and 6 of the EP).
Marine Birds		
Southern giant petrel	National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC, 2011a) Background Paper, Population Status and Threats to Albatrosses and Giant Petrels Listed as Threatened under the Environment and Biodiversity Conservation Act	• The plan constitutes the Australian National Recovery Plan for a number of albatross and giant petrel species under the EPBC Act 1999 from 2011 to 2016. Under the Act, the Environment Minster must review a recovery plan at intervals of not longer than 5 years. The plan is due a review. • The plan considers habitat critical to the survival of albatrosses and giant petrels as breeding and foraging habitat. There are no BIAs for these species within the Operational Area or spill EMBA. • The Recovery Plan (DSEWPaC, 2011a) and the accompanying Background Paper (DSEWPaC, 2011b) lists a number of threats to the albatross and giant petrel species in Australian waters. Threats applicable to the Activity are marine debris (non-biodegradable, floating materials) and habitat modification from marine pollution (oil spills). This EP assesses potential impacts and risks to seabirds from various unplanned spills in Section 6 of the EP. Impacts and risks associated with solid wastes (hazardous and non-hazardous) are provided Section 5 of the EP.

	1999 (DSEWPaC, 2011b)	
Red knot	Approved Conservation Advice (TSSC, 2016)	• The red knot may occur in the Operational Area and spill EMBA. • The Approved Conservation Advice lists a number of threats to the species in Australian waters. None of the threats identified are applicable to the Activity. This EP assesses potential impacts and risks to seabirds from various unplanned spills in Section 6 of the EP.
EPBC Act listed marine seabird species identified as occurring in the Operational Area and spill EMBA at risk of being adversely impacted by marine debris: • Southern giant petrel	Draft Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life (DoEE, 2017)	• The threat abatement plan is being revised and the draft plan is currently released for public comment. • The plan recognises harmful marine debris includes ship-sourced, solid non-biodegradable material disposed of at sea is a risk to vertebrate marine life through entanglement or ingestion. The Draft Abatement Plan includes an appendix of EPBC Act listed species at risk of being impacted by marine debris. Of those species listed in the draft plan, only one (southern giant petrel) may potentially occur within the Operational Area and spill EMBA.

3.7 MARINE FLORA AND FAUNA

3.7.1 Fish

The Operational Area lies over the Exmouth Plateau which is described as a unique seafloor features that may serve an important ecological roles through upwelling of deeper water nutrients.

The demersal zone of the NWS (which includes the Northwest Province and Northwest Shelf Province) hosts a diverse assemblage of fish of tropical Indo-west Pacific affinity, with up to 1,400 species known to occur, with a great proportion of these occurring in shallow coastal waters (Allen *et al*. 1986).

Within the southern portion of the Northwest Province, small pelagic fish (e.g. lantern fishes) comprise a third of the total fish biomass (Bulman, 2006) and inhabit a range of marine environments, including inshore and continental shelf waters. These small pelagic fish play an important ecological role, not only for this particular area but for the entire North-west Marine Region. They feed on pelagic phytoplankton and zooplankton and provide a food source for a wide variety of predators such as marine mammals, sharks, large pelagic fish and seabirds, thus providing a vital link between many of the region's trophic systems (Mackie *et al*. 2007, Brewer *et al*. 2007).

Using the online Protected Matters Search Tool (PMST), a search of the EPBC Act Protected Matters Database was undertaken for the permit areas and the spill EMBA to identify the potential presence of

any species or communities listed as Matters of National Environmental Significance under the EPBC Act (the Protected Matters Reports are provided in Appendix D. The following species may occur within the Operational Area and the EMBA.

3.7.1.1 Great White Shark

The great white shark is listed as Vulnerable under the EPBC Act. In Australian waters, they are widely but not evenly distributed and sightings are considered uncommon to rare compared to most other large sharks (CITES, 2004). Great white sharks can be found in areas close inshore around rocky reefs, surf beaches and shallow coastal bays and also as far out as the outer continental shelf and slope areas (Pogonoski *et al*., 2002). Given the species occurs along the length of the Western Australian coastline, and undertakes pelagic and offshore movements, it is possible to occur within the Operational Area and EMBA.

3.7.1.2 Shortfin Mako Shark

Offshore littoral and epipelagic shark species found in depths up to 500 m. Widespread throughout tropical and temperate oceans worldwide (Cailliet *et al*, 2009). Known to migrate distances >3000 km. Paucity of information on migratory patterns or timing. Given the species undertakes pelagic and offshore movements, it is possible to occur within the Operational Area and EMBA.

3.7.1.3 Longfin Mako Shark

The longfin mako is listed as migratory under the EPBC Act, and is classified as Vulnerable on the World Conservation Union's Red List of Threatened Species (Reardon *et al*., 2006). The longfin mako is a widely distributed oceanic tropical shark, but rarely encountered. Given the species undertakes pelagic and offshore movements, it is possible to occur within the Operational Area and EMBA.

3.7.1.4 Giant Manta Ray

The largest of the rays, this species has a tropical and semi-temperate distribution around Australia's coastline. This species appears to be a seasonal visitor to coastal areas; exact timings of appearance on the NWS are not well documented. Locally, this species is distributed sparsely but normally shallower than the 50 m water depth contour (Jenner *et al*., 2010). It is therefore unlikely to be present in the Operational Area and spill EMBA.

3.7.2 Marine Mammals

Marine mammals represent a diverse group of animals that including cetaceans (whales, dolphins and porpoises), pinnepeds (seals, sea lions), sirenians (dugongs) and fissipeds (polar bears). Forty-five species of cetacean occur in Australian waters, of these, nine species are known to occur regularly in

the waters of the North Marine Regions, including three species of whale and six species of dolphin (DSEWPaC, 2011c). Under the EPBC Act, all cetaceans and pinnepeds are protected in Australian waters. The following protected marine mammal species may occur within the Operational Area and the EMBA. Listed Threatened and Migratory species are considered MNES and are therefore discussed in more detail in this Section.

3.7.2.1 Sei Whale

Sei whales tend to be found further offshore than other species of large whales (Bannister *et al*. 1996). The sei whale moves between Australian waters and Antarctic feeding areas, however they are only infrequently recorded in Australian waters (Bannister *et al*. 1996) and their movements and distribution in Australian waters is not well known. There are no known mating or calving areas in Australian waters. The Blue, Fin and Sei Whale Recovery Plan and the National Conservation Values Atlas currently record no biologically important areas for this species. It is therefore unlikely to be present in the Operational Area and spill EMBA.

3.7.2.2 Blue whale

In the southern hemisphere, there are two recognised subspecies of blue whale that are both recorded in Australian waters, the southern (or 'true') blue whale (*Balaenoptera musculus intermedia*) and the 'pygmy' blue whale (*Balaenoptera musculus brevicauda*). In general, southern blue whales occur in waters south of 60°S and pygmy blue whale occur in waters north of 55°S (i.e. not in the Antarctic). By this definition all blue whales in waters from Kalbarri to the Northern Territory border (and therefore within the operational areas and spill EMBA) are assumed to be pygmy blue whales, and are discussed below.

Blue whales typically feed as individuals or in small groups. In Australia, there are only two known feeding aggregations at Perth Canyon off the coast of southern Western Australia and the Bonney Upwelling, which runs along the coast of South Australia into Victoria.

Pygmy blue whales have a southern hemisphere distribution, migrating from tropical water breeding grounds in winter to temperate and polar water feeding grounds in summer (Bannister *et al*. 1996, Double *et al*. 2014). During the southern migration, pygmy blue whales pass south of the Montebello Islands and Exmouth from October to the end of January, peaking in late November to early December (Double *et al*. 2012).

Migrating north, tagging surveys have shown pygmy blue whales migrating northward relatively near to the Australian coastline (100 km) until reaching North West Cape after which they travelled offshore (240 km) to Indonesia. Blue whales have been detected off Exmouth and the Montebello Islands between April and August (Double *et al*. 2012, McCauley & Jenner 2010).

Passive acoustic data documented pygmy blue whales migrating along the Western Australian shelf break at depth of 500 to 1,000 m (McCauley & Jenner 2010, Woodside 2012) (Figure 3-2).

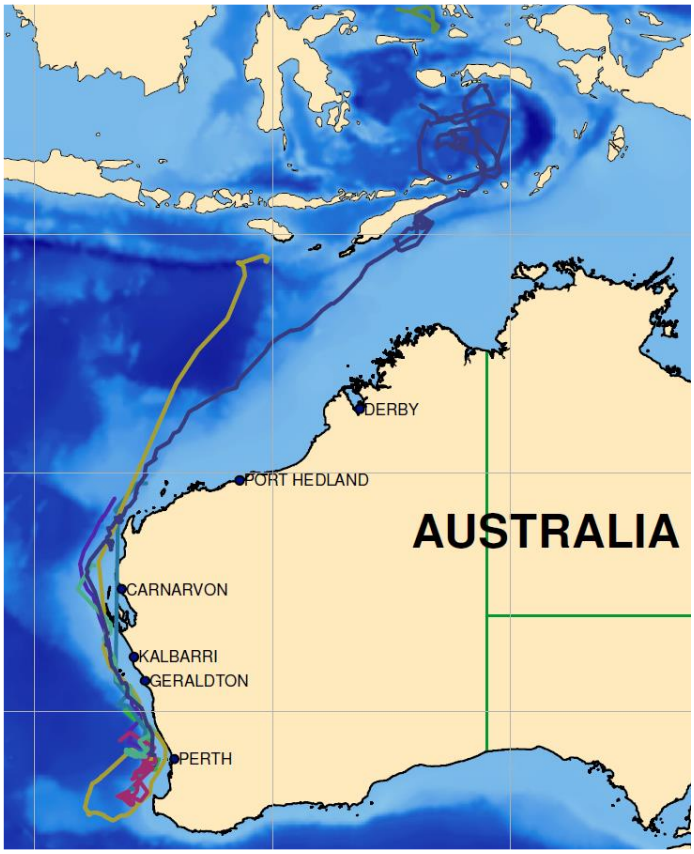

Figure 3-2: Satellite tracking of Blue Whales in 2010/2011, modified from Double *et al*. (2012)

3.7.2.3 Fin Whales

Fin whales have a worldwide distribution generally in deeper waters, with oceanic migrations between warm water breeding grounds and cold water feeding grounds.

The fin whale distribution in Australia is not clear due to the scarcity of sightings. According to the Species Profile and Threats database, fin whales are thought to be present from Exmouth, along the southern coastline, to southern Queensland.

Migration paths are uncertain but are not thought to follow Australian coastlines (Bannister *et al*. 1996). There is insufficient data to prescribe migration times for fin whales. During summer and autumn this species has been recorded visually at the Bonney Upwelling and acoustically at the Rottnest Trench.

There are no known mating or calving areas in Australian waters and no biologically important areas for the fin whale are currently identified by the National Conservation Values Atlas or Blue, Fin and Sei Whale Recovery Plan. It is therefore unlikely to be present in the Operational Area and spill EMBA.

3.7.2.4 Humpback whale

Humpback whales occur throughout Australian waters, their distribution being influenced by their migratory pathways and aggregation areas for resting, breeding and calving.

In the southern hemisphere, humpback whale populations spend the summer months feeding in the Antarctic polar region before migrating north to tropical breeding/calving grounds in the coastal waters of the Kimberley.

Aerial surveys and noise logger recordings undertaken for Chevron's Wheatstone Project show that the main distribution of humpback whales were sighted at an average distance of 50 km from the mainland during the northern migration and 35 km during the southbound migration (RPS, 2010). The southbound migration moves down the coast between late August and November, although females with calves have been documented leaving the calving areas last, with a later peak in abundance observed from mid-August to mid-September (Jenner *et al*. 2001). Figure 3-3 illustrates the results of aerial surveys conducted during a single year between the north-west cape and Barrow Island.

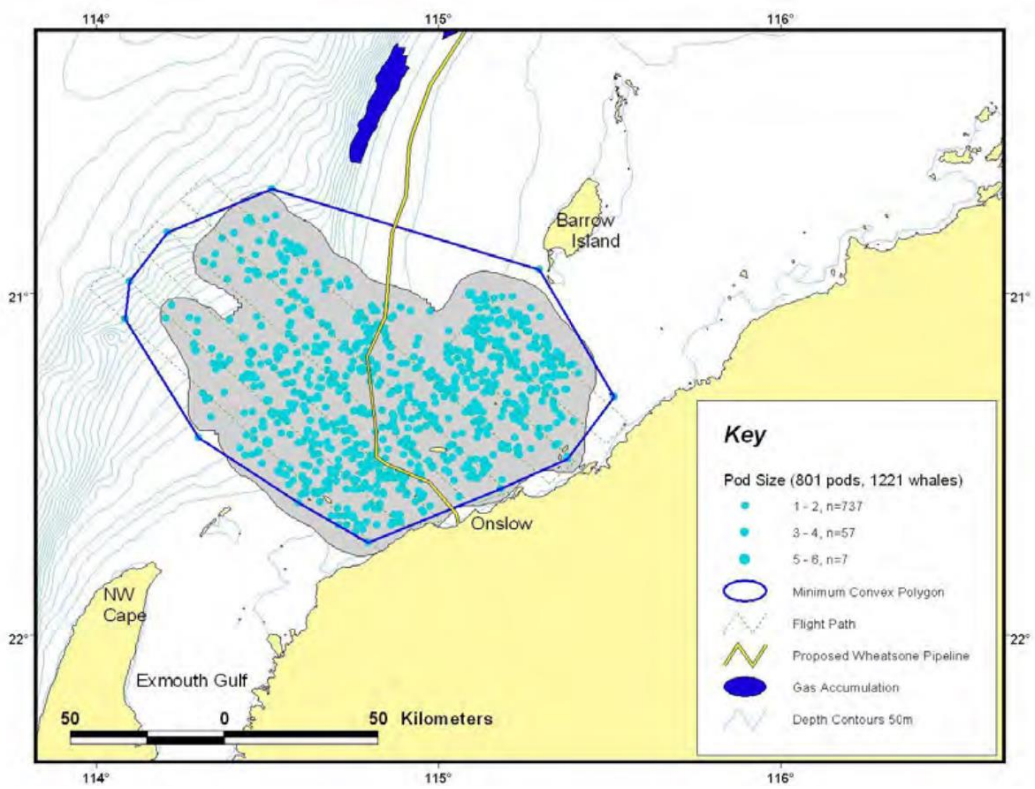

Figure 3-3: Aerial survey sightings of humpback whales from June to December 2009 (taken from Jenner *et al*., 2010)

3.7.2.5 Bryde's Whale

Bryde's whale is known to inhabit tropical and warm temperate waters, travelling alone or in pairs. There is a small estimated population in Australian waters (DoE, 2014a) and is thought to migrate towards warmer waters during winter, although not enough data is available to understand movement routes or timing. Due to a small populations and a lack of sightings of this whale in a commercially active area it is considered unlikely to be encountered within the Operational Area or EMBA.

3.7.2.6 Antarctic Minke Whale

Generally inhabits waters from 21°S to 65°S (Bannister *et al*., 1996). No population estimates are available for Australian waters. This whale migrates between summer Antarctic feeding grounds and winter sub-tropical breeding grounds. Due to a small populations and a lack of sightings of this whale in a commercially active area it is considered unlikely to be encountered within the Operational Area or EMBA.

3.7.2.7 Sperm Whale

The sperm whale has been recorded in all Australian States (Bannister *et al*., 1996). No population estimates are available for Australian waters. Uncommon in waters greater than 300 m and generally southwards in summer and northwards in winter (to tropical breeding grounds).

3.7.2.8 Killer Whale

Killer whales are the largest member of the dolphin family. Observations of this species have occurred in both tropical and temperate waters across oceanic, pelagic and neritic waters. Animals tend to be gregarious, usually forming pods of 10-30 animals of all genders and ages (DoE 2014b). Killer whales make seasonal migrations, and may follow regular migratory pathways; however this has not been proven.

Killer whales have been recorded relocating to Antarctic waters during summer months and back to warmer waters during winter. This suggests that the winter months would be the highest likelihood of occurrence of killer whales outside of the Antarctic. Killer whales are top-level carnivores that have been known to attack dolphins, young whales and sea lions.

Killer whale observations are uncommon in the Pilbara, with recent observations during the months of December and May.

3.7.2.9 Other Cetaceans

In addition to the cetaceans listed as MNES under the EPBC Act, several other species of whales and pelagic dolphins are known from the region and may occur in the EMBA. Many of these species are

frequently associated with oceanographic or seafloor features that are not present in the EMBA and therefore are not expected to occur in significant numbers during the Activity. Oceanic dolphins are often gregarious and frequently recorded in mixed schools with other cetacean species.

The following descriptions of these cetaceans have been primarily sourced from the Species Group Report Card - Cetaceans (DSEWPaC 2012a) or from DotEE Species Profile and Threats (SPRAT) database profiles (DotEE 2017b).

Common Dolphin

Common dolphins have been recorded in offshore waters off all Australian states and territories but are rarely seen in northern Australian waters (Ross 2006). They appear to occur in two main locations around Australia: the southern south-eastern Indian Ocean and in the Tasman Sea. The species feeds on a variety of small prey, mainly epipelagic schooling and mesopelagic fishes, cephalopods and crustaceans.

Minke Whale

The minke whale is distributed worldwide in oceanic habitats, feeding in cold waters and migrating to warmer waters to breed (Bannister et al. 1996). Relatively common and generally an offshore species but not restricted to deeper waters and have been recorded close to coastlines. Their distribution in Australia is thought to extend northward off the WA coast to 20° S. The species feeds predominantly on *Euphausia superba* and some smaller euphausiid species. Often occur singly or in groups of two to three, though feeding congregations may be encountered (Bannister et al. 1996).

Pygmy Killer Whale

The Pygmy Killer Whale is a tropical and subtropical species that inhabits oceanic waters and is known from strandings in NSW and Western Australia, with the current extent of occurrence in Australia considered to include all waters north of 35° S. They are generally considered to occur in relatively low abundance (Reeves et al. 2003) with the total number of mature animals within Australian waters less than 10 000, typically in group sizes less than 50 individuals. Pygmy killer whales are wary of boats and tend to bunch together when disturbed (Leatherwood & Reeves 1983). The species is not well surveyed within Australian waters, but their prey is known to include other cetaceans.

Short-finned Pilot Whale

Short-finned pilot whales occur in tropical to temperate (10–32 °C) oceanic waters in Australia, generally occurring at the edge of the continental shelf and over deep submarine canyons. The current distribution for the species is considered to extend north of about 41°S (Ross 2006). They feed mainly on squid, cuttlefish, octopus and some fish. Seasonal inshore and offshore movements may occur in response to abundance and spawning of prey.

Pygmy Sperm Whale

The Pygmy sperm whale inhabits open-ocean temperate to tropical waters around the world and have been reported for all Australian states, apart from the Northern Territory (Ross 2006). They are thought to live mostly beyond the edge of the continental shelf. The species is thought to feed in deep water mostly on cephalopods, but also on deep-sea fishes and shrimps.

Dwarf Sperm Whale

The dwarf sperm whale occurs in all oceans apart from polar or sub-polar seas and is considered oceanic (Ross 2006), generally occurring in areas >200 m deep but may also approach coastal areas. They have been recorded (mostly as stranded animals) from Western Australia, South Australia, Tasmania, NSW and the Northern Territory. Dwarf sperm whales feed in deep water on cephalopods and, less often, on deep-sea fishes and crustaceans

Blainvilles Beaked Whale

Blainville's beaked whale is considered to have an oceanic distribution encompassing waters off most states of Australia, although with a preference for tropical and warm temperate waters ranging from 700–1000 m deep, often adjacent to much deeper waters (Bannister et al. 1996). Sightings and strandings are rare in Australia and population estimates not available, but the species is the most common of the beaked whales in tropical waters.

Melon-headed Whale

Melon-headed whales are pantropical, occurring in all deep oceanic waters between 35° N and 35° S (DEWHA 2008). Most sightings of this species are from the continental shelf seaward, and around oceanic islands. They feed on pelagic squid and fishes, and occasionally crustaceans and may occur in groups of less than 40 up to large herds of 150–1500 animals.

False Killer Whale

False killer whales are found worldwide in deep offshore tropical and temperate waters and estimated to occur in all Australian waters north of 35° S. They typically occur in herds of about 20–50 animals, but aggregations of between 100 to 800 individuals from temporary associations of several smaller herds may occur to exploit locally abundant prey (Ross 2006). False killer whales primarily eat fish and cephalopods but appear to be opportunistic feeders, consuming a large size range and wide variety of prey.

Common bottlenose dolphin

Bottlenose dolphins are widespread in the region with both inshore and offshore forms known to occur (Hoelzel et al 1998). The offshore form ranges widely and feeds on mesopelagic fish and oceanic squid.

Fraser's dolphin

Fraser's dolphins are generally found in deep oceanic waters in association with areas of increased productivity, such as upwellings and where islands abut deep water. They feed on a wide range of fish, squid and crustaceans from throughout the water column to depths of 600 m.

Risso's dolphin

Risso's dolphin is widely distributed in deep waters (400–1000 m) of the region, often in areas of upwelling or steep seabed relief such as seamounts and escarpments. Oceanic cephalopods are its main prey.

Rough-toothed dolphin

The rough-toothed dolphin is usually found in deep offshore waters, often around the edges of oceanic reefs but have also been recorded around Barrow Island. Most of the species' prey comprises fish and squid. They are known to dive to at least 70 m.

Pantropical spotted dolphin, spinner dolphin and striped dolphin

The taxonomy of Stenella species is not completely resolved and they are discussed in DSEWPaC (2012a) as one group due to similarities in habitat, prey and associations. They occur in tropical and subtropical waters of the world with their distribution closely linked to oceanographic processes such as upwelling, currents and frontal zones. Stenella can dive to depths of 200–300 m and generally feed on small squid, shrimp and fish in the mesopelagic zone.

Little is known about the distribution of Stenella species in the North-west Marine Region, and available data is limited. They have been recorded at the shelf edge and shelf slope area of the Browse Basin and in small groups resting in nearshore areas of the Kimberley coast. The striped dolphin is abundant around Barrow Island.

Cuvier's Beaked Whale

Cuvier's beaked whales has a worldwide distribution in all temperate and tropical waters, and in Australia, are estimated to occur in all waters >200m depth and north of 55° S. The species tends to avoid vessels, with the few confirmed sightings usually alone or in small groups (up to seven individuals). Off Australia, Cuvier's beaked whales appear to feed primarily on oceanic squid, many of which have also been recorded from studies elsewhere in the world (Bannister et al. 1996). Seasonal migrations may occur, with most recordings in Australia between January to July (Ross 2006).

3.7.3 Marine Reptiles

Marine reptiles represent a group of animals that include sea turtles, sea snakes and saltwater crocodiles. Under the *Environmental Protection and Biodiversity Conservation Act 1999*, all marine reptiles are protected in Australian waters, and are therefore discussed in more detail in the following Section. The North-west Marine Region is an important area for several species of marine reptiles, including marine turtles and sea snakes (DSEWPaC, 2012b). The following protected marine reptile species may occur within the Operational Area and the EMBA.

3.7.3.1 Loggerhead turtle

The loggerhead turtle has a worldwide distribution, living and breeding in subtropical to tropical and locations (Limpus, 2008a). Nesting and breeding on the west coast of Australia occurs from November to March, with a peak in late December/early January (DoE, 2014c). Occasional late summer nesting crawls have been recorded at Barrow and the Lowendal Islands. Major nesting locations include the Muiron Islands and the Ningaloo Coast south to Carnarvon (Limpus, 2008a).

Foraging areas are widespread for loggerhead turtle and migrations from nesting to feeding grounds can stretch 1000s of kilometres, including feeding grounds as far north as the Java Sea of Indonesia for the WA population (Limpus, 2008a). Loggerhead turtles are carnivorous and feed primarily on benthic invertebrates from depths of 50 m to near shore tidal areas (DoE, 2014c) including areas of rocky and coral reef, muddy bays, sand flats, estuaries and seagrass meadows (Limpus, 2008a).

Considering the water depths of the Operational Area and EMBA, the loggerhead is unlikely to be using this area for feeding, nor are these areas between known nesting, interesting or feeding areas and therefore it is unlikely that loggerhead turtles will be using or transiting through these areas.

3.7.3.2 Green turtle

The green turtle has a worldwide tropical and subtropical distribution and is widespread and abundant in WA waters, with an estimated 20,000 individuals occurring in WA (Limpus, 2008b). The NWS stock nests on sandy beaches extending from the Ningaloo Coast to the Lacepede Islands (Limpus, 2008b), with nesting occurring between November and March. The key nesting areas include the Dampier Archipelago, Lacepede Islands, the Ningaloo and Jurabi Coasts, Thevenard Island, Barrow Island, the Lowendal and Montebello Islands, Northwest Cape, Exmouth Gulf and the Muiron Islands.

Green turtles spend the first five to ten years of their life drifting on ocean currents, before moving to reside in shallower benthic habitats, including tropical reef and seagrass beds. Green turtles have been known to migrate more than 2,600 km between feeding and breeding grounds (DoE, 2014d). Green turtles are omnivores, mainly feeding in shallow benthic habitats on seagrass and/or algae, but are also known to feed on sponges, jellyfish and mangroves (DoE, 2014d).

Considering the water depths of the Operational Area and EMBA, the green turtle is unlikely to be using this area for feeding, nor are these areas between known nesting, interesting or feeding areas and therefore it is unlikely that green turtles will be using or transiting through these areas.

3.7.3.3 Hawksbill turtle

Hawksbill turtles have a global distribution throughout tropical and sub-tropical marine waters. The WA stock is concentrated on the NWS (Limpus, 2009a), and is one of the largest hawksbill populations in the world. The most significant breeding areas are around the sandy beaches of the Dampier Archipelago and the Montebello Islands.

Nesting occurs throughout the year in WA, peaking between October and January (Woodside, 2006). With an interbreeding period of 2–4 years, 2,000–4,500 hawksbill turtles probably nest in WA waters (Morris, 2004). Individuals may migrate up to 2,400 km between their nesting and foraging grounds Satellite tracking of nesting turtles on Varanus Island and Rosemary Island has shown adult turtles to feed between 50 and 450 km from their nesting beaches. Adults tend to forage in tropical tidal and sub-tidal coral and rocky reef habitat where they feed on an omnivorous diet of sponges, algae, jelly fish and cephalopods.

Considering distances from known nesting and feeding areas, the hawksbill turtle is unlikely to be using or transiting through these areas.

3.7.3.4 Leatherback turtle

The leatherback turtle has the widest distribution of any marine turtle, and can be found from tropical to temperate waters throughout the world (Márquez, 1990). Only irregular and isolated nesting (one to three nests per annum) occurs in southern Queensland and the Northern Territory (Limpus and McLachlin, 1994).

There have been several observations of leatherback turtles off of the coast of WA, further south than the NWS (Limpus, 2009b). Due to the lack of nesting sites around Australian coastal waters, it is presumed that leatherback turtles observed in Australian waters are migrating from neighbouring countries to utilise feeding grounds in Australia (Limpus, 2009b). The leatherback turtle will feed at all levels of the water column and is carnivorous.

3.7.3.5 Flatback turtle

The flatback turtle has an Australasian distribution, with all recorded nesting beaches occurring within tropical to sub-tropical Australian waters (Limpus, 2007). Breeding on the NWS region peaks in the summer months, with nesting areas from approximately Exmouth in the south, to the Lacepede Islands in the north. Significant nesting areas exist in the Dampier Archipelago and Kimberley region, the

Montebello and Lowendal islands and Barrow and Varanus Island, and also along the mainland beaches of the Pilbara coast (Limpus, 2007, DoE, 2014e).

The flatback turtle lacks a wide oceanic dispersal phase and adults tend to be found foraging on soft sediment habitats within the continental shelf of northern Australia (DoE, 2014e). Limited migration information on the NWS group is available; post nesting recaptures have been recorded from Exmouth Gulf to the Kimberley Coast and also from the Northern Territory (Limpus, 2007).

Considering distances from known nesting and feeding areas, the flatback turtle is unlikely to be using or transiting through these areas.

3.7.3.6 Sea Snakes

Storr *et al*. (1986) estimate that 22 species of sea snakes and kraits occur in WA waters, however there is a paucity of information on the distribution of individual species, population sizes or aspects of their ecology. Sea snakes inhabit offshore and nearshore habitats, throughout the tropical and sub-tropical waters of Western Australia. The small amount of ecological data available indicates that sea snakes have a restricted and patchy distribution and the number of species increases towards the northern parts of the North-west Marine Region (DSEWPaC 2012b). The EPBC Act protected matters database indicates seven species of sea snake may occur in the EMBA. The following information on these species has been compiled from SPRAT profiles.

The olive sea snake inhabits tropical and subtropical coastal and coral reef waters in northern Australia, including north from Exmouth in WA. A significant barrier to its movement is created by large, deep water expanses. The spectacled sea snake is considered to be confined to coastal waters (Cogger 2000). The north-western mangrove sea snake inhabits the intertidal zone of tidal creeks and flats of relatively compact mud or sandy mud with crab and mud skipper holes (Cogger 2000). The elegant sea snake uses a variety of marine and estuarine habitats, from sandy substrates in very shallow waters to depths of approximately 80 m (Limpus 1975). The remote offshore location and very deep waters of the EMBA therefore make it very unlikely these species will occur in the area.

The olive-headed sea snake is widely distributed in the tropical waters of northern Australia, from Shark Bay in WA. The species has been recorded in sand or mud habitats in water depths between 3–10 m (Limpus 1975). Considering the distances to shallow waters, olive-headed sea snakes are unlikely to be using or transiting through the EMBA.

Fine-spined sea snakes occur off the Pilbara coast and have been collected from up to 140 km north west of Dampier, WA, and recorded in trawl nets in water depths up to 103 m. Little is known of their seafloor preferences.

The yellow-bellied sea snake is the most widely distributed of all sea snakes and common in tropical oceans worldwide. The species is usually found within a few kilometers of the coast and prefers shallow inshore waters. However, they are also known to occur in open waters well away from coasts and reefs, where they live among drift lines eating fish attracted to the cover. They may occur in the EMBA, although given the distances from shorelines are unlikely to be present in significant numbers.

3.7.4 Birds

Coastal or terrestrial species inhabit the offshore islands and coastal areas of the mainland throughout the year. These species are either primarily terrestrial, or they may forage in coastal waters. Resident coastal and terrestrial species include osprey (*Pandion haliaetus*), white-bellied sea eagle (*Haliaeetus leucogaster*), silver gull (*Larus novaehollandiae*) and eastern reef egret (*Egreta sacra*) (DEWHA 2008).

Seabirds include those species whose primary habitat and food source is derived from pelagic waters. These species spend the majority of their lives at sea, ranging over large distances to forage over the open ocean. Seabirds present in the area include terns, noddies, petrels, shearwaters, tropicbirds, cormorants frigatebirds, shearwaters, petrels, terns, boobies and albatrosses (DEWHA 2008).

Shorebirds, including waders, inhabit the intertidal zone and adjacent areas. Other shorebirds are migratory and include species that utilise the East Asian–Australasian Flyway, a migratory pathway for millions of migratory shorebirds that travel from Northern Hemisphere breeding grounds to Southern Hemisphere resting and foraging areas. Shorebirds that regularly migrate through the area include the Scolopacidae (curlews, sandpipers *etc*.) and Charadriidae (plovers and lapwings) families.

The following protected marine bird species that may occur within the Operational Area and the EMBAs.

3.7.4.1 Southern Giant Petrel

The southern giant-petrel is the largest of the petrels and occurs from Antarctic to subtropical waters. The petrel spends the majority of the warmer months of the year in the southern extents of its distribution range whilst breeding, before leaving for warmer waters during winter, including the southern portion of the NWS region for foraging. The southern giant-petrel is both an opportunistic scavenger of carrion and a predator, with prey items ranging from surface marine life (including krill) to smaller seabirds (DoE, 2013i).

3.7.4.2 Red Knot

The red knot is a non-breeding visitor to Australia. Typically found feeding and roosting around intertidal and shallow coastal areas (Higgins & Davies 1996).

Due to the distance offshore and from roosting areas, the red knot is unlikely to be found in the Operational Area or spill EMBA unless transiting through the area on migrations.

3.7.4.3 Common Noddy

The common noddy is typically found feeding and roosting around coastal areas. Outside of the breeding season, this species has been found foraging hundreds of kilometers from breeding islands on fish, squid and other pelagic molluscs (Higgins & Davies 1996). Therefore, the common noddy may be found feeding or transiting through the Operational Area or EMBA.

3.7.4.4 Lesser Frigatebird

The lesser frigatebird is a marine bird with known breeding ground on remote islands in north-western Australia. The frigatebird is known to feed off fish in the open ocean. Although not known for travelling such distances to feed, the lesser frigatebird may be found in the Operational Area or EMBA.

4 SOCIO-ECONOMIC ENVIRONMENT

4.1 COMMERCIAL FISHERIES

4.1.1 Commonwealth Fisheries

Commonwealth fisheries are those within the 200 nautical mile Australian Fishing Zone managed by Australian Fisheries Management Authority (AFMA) and are, on the high seas, and, in some cases, by agreement with the States and Territory, to the low water mark. Australian Fishery boundaries can be seen in Figure 4-1.

Relevant to the Operational Area and spill EMBA are five Commonwealth managed fisheries (Australian Fisheries Management Authority, 2014a):

- Western Tuna and Billfish Fishery
- Western Deepwater Trawl Fishery
- Western Skipjack Fishery
- Southern Bluefin Tuna Fishery
- North West Slope Trawl Fishery

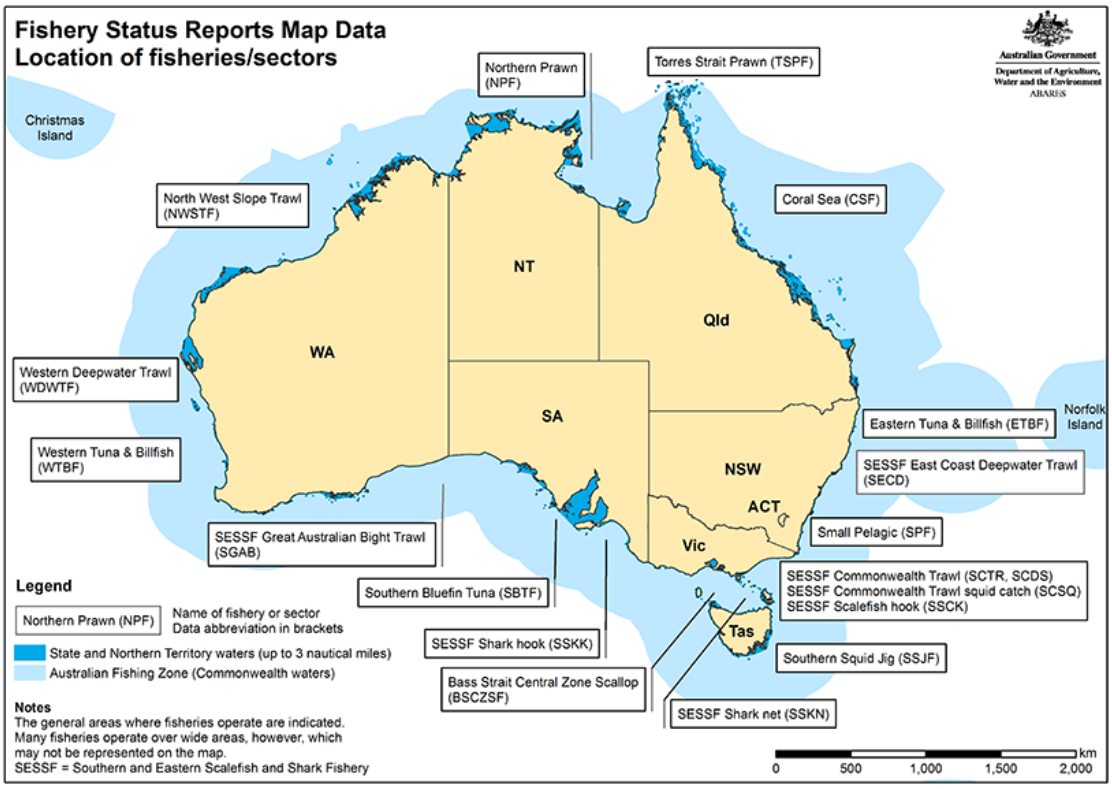

Figure 4-1: Australian Fisheries (ABARES, 2022)

4.1.1.1 Western Tuna and Billfish Fishery

The Western Tuna and Billfish Fishery extends eastward from the Victorian/South Australian border throughout South Australia and Western Australia waters to waters immediately westward of Cape York Peninsula (Figure 4-2) (Australian Fisheries Management Authority, 2014b). There are currently 95 boats operating in the fleet that principally target the broadbill swordfish (*Xiphias gladius*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*) and albacore tuna (*T. alalunga*).

4.1.1.2 Western Deepwater Trawl Fishery

The WDWTF is located from the 200 m isobath to the edge of the Australian Fishing Zone. Within the fishery boundary of Western Australia, the catches of commercially important species by weight are separated into two distinct geographic regions. The two regions are from the Northwest Shelf to Geraldton, and from Geraldton to Margaret River and southwest Western Australia (Figure 4-3). The key species are a diverse range of finfish species, with catches primarily landed from the upper (200 m to 700 m) and mid-continental shelf (Australian Fisheries Management Authority, 2014c). The WDWTF does not fish in waters past 800 m and therefore does not interfere with any planned activities occurring within the Operational Area.

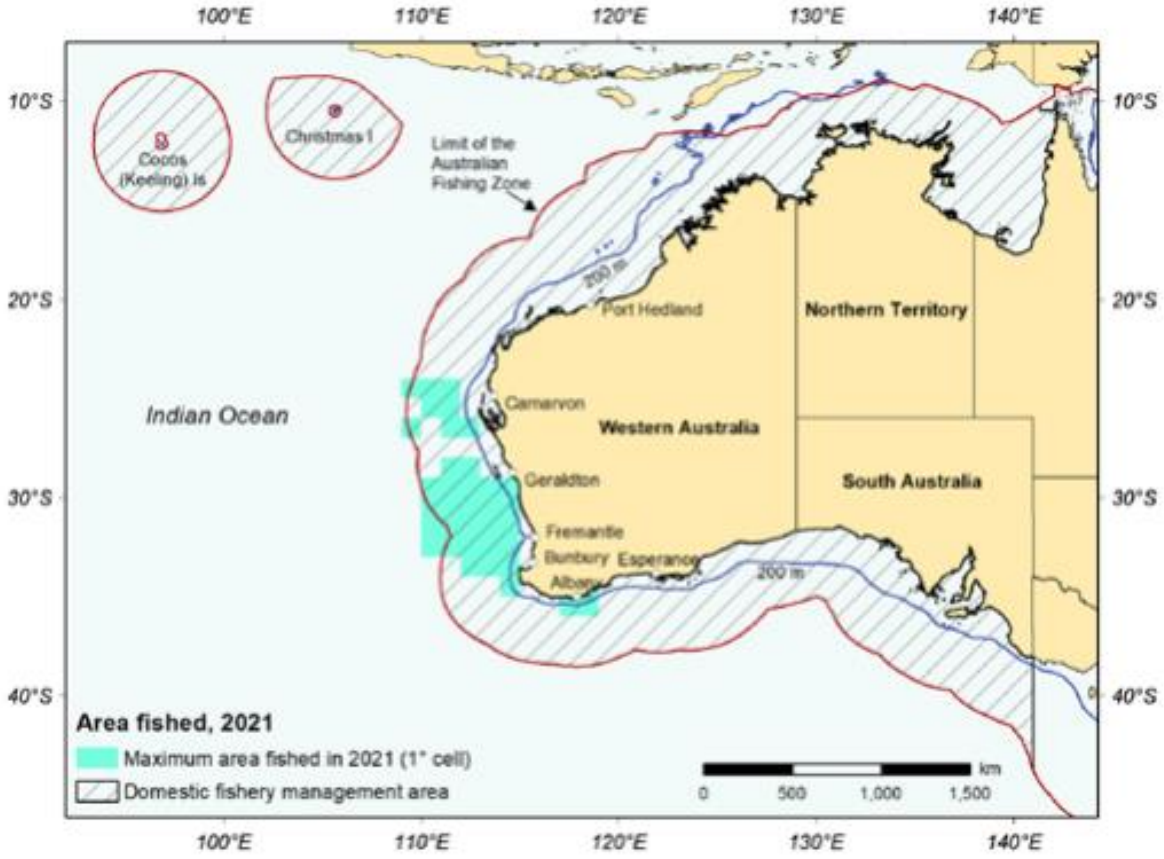

Figure 4-2: Western Tuna and Billfish Fishery Zone Map (Australian Fisheries Management Authority, 2022a)

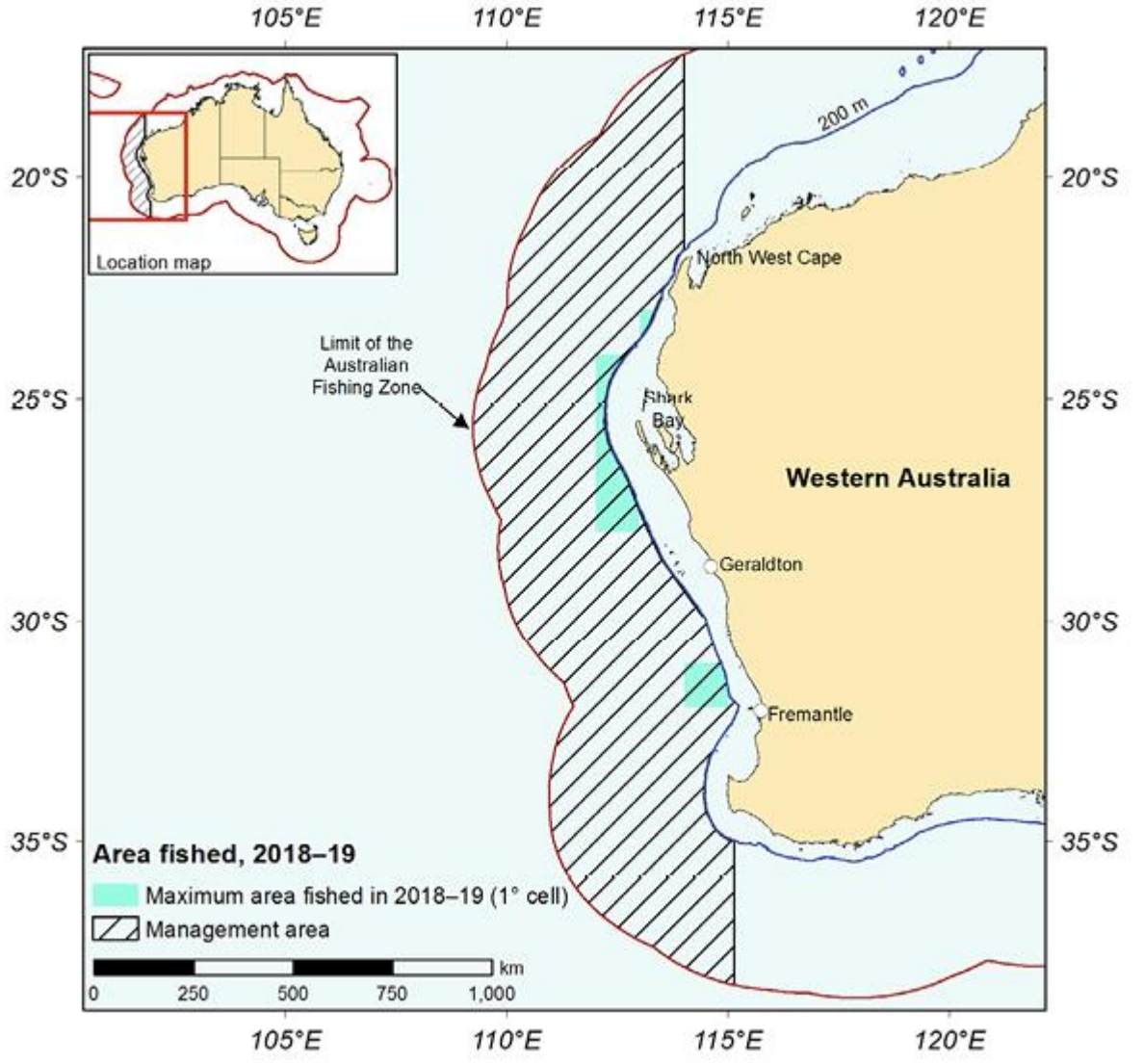

Figure 4-3: Western Deep Water Trawl Fishery boundary (Department of Agriculture, Forestry and Fisheries, 2022a)

4.1.1.3 Western Skipjack Fishery

The Skipjack Tuna fishery within the waters of Western Australia operates within the same jurisdictional boundaries as the Western Tuna and Billfish Fishery (Figure 4-4). The fishery has a single target species, being the skipjack tuna (*Katsuwonus pelamis*) with 13 license holders previously operating in western Australian waters (Australian Fisheries Management Authority, 2014d). However, there has been no activity in this fishery since 2009 and the management arrangements are under review (Australian Fisheries Management Authority, 2017).

4.1.1.4 Southern Bluefin Tuna Fishery

Given the highly migratory nature of the southern bluefin tuna (*Thunnus maccoyii*), the Southern Bluefin Tuna Fishery occurs in all Australian Waters (Australian Fisheries Management Authority, 2014e). Catches are generally highest within South Australia and South East Australian waters.

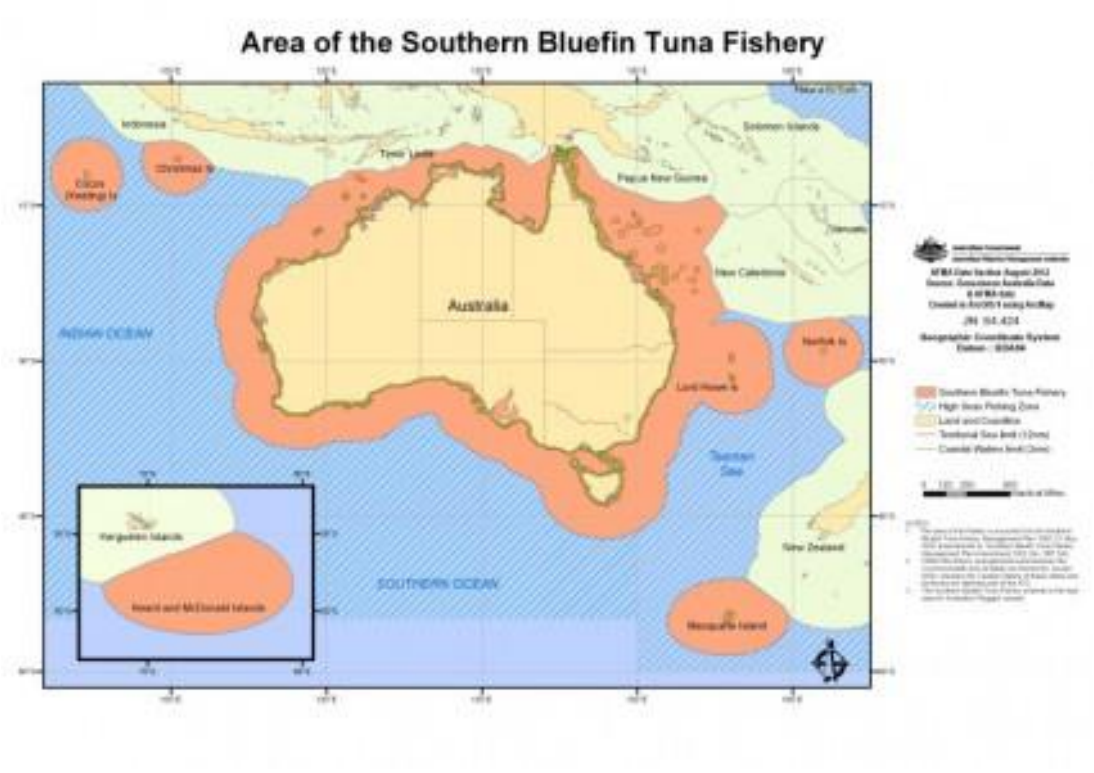

Figure 4-4: Southern Bluefin Tuna Fishery (Australian Fisheries Management Authority, 2022b)

4.1.1.5 North West Slope Trawl Fishery

The North West Slope Trawl is designated from 114°E to about 125°E off the Western Australian coast between the line approximating the 200 m isobath and the outer limit of the Australian Fishing Zone, but taking into account Australian-Indonesian maritime boundaries. The fishery targets scampi and prawns. As of June 2012, there are 7 license holders operating within this fishery (Australian Fisheries Management Authority 2014f).

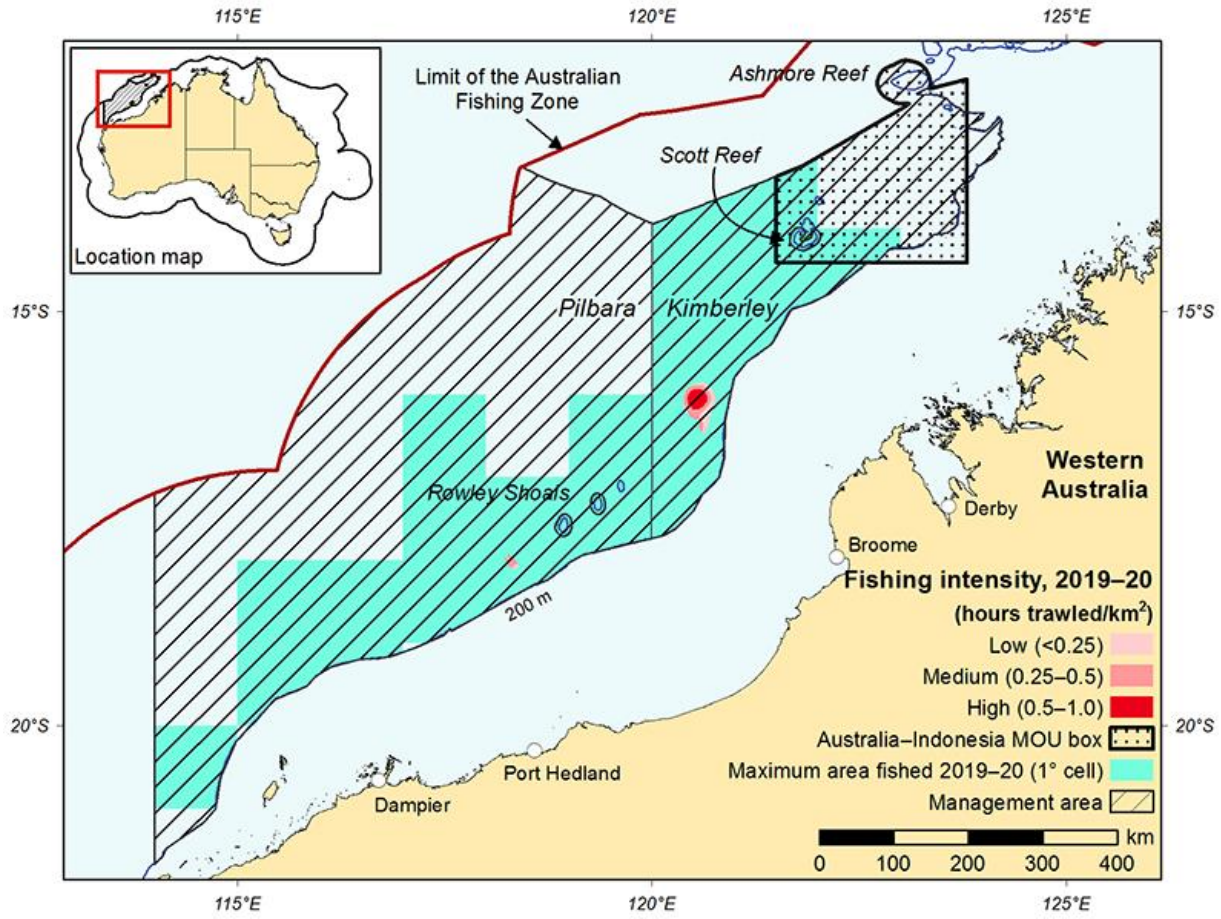

Figure 4-5: North West Slope Trawl Fishery boundary (Department of Agriculture, Forestry and Fisheries, 2022b)

4.1.2 State Fisheries

State fisheries are managed by the WA Department of Primary Industries and Regional Development - Fisheries (DPIRD - Fisheries) with specific management plans, regulations and a variety of subsidiary regulatory instruments under the *Fish Resources Management Act 1994* (WA). The information on State managed fisheries has been derived from the State of Fisheries Report 2012/2013 (Fletcher and Santoro, 2013).

State managed fisheries occur with zones that overlap or are in close proximity to the Operational Area and hydrocarbon spill EMBA. These fisheries are managed by DPIRD – Fisheries (WA DoF, 2015) and include:

- Mackerel managed Fishery (zones 2 and 3)
- Northern Shark Fishery
- Pearl Oyster Managed Fishery (Zone 1)

- West Coast Deep Sea Crustacean Managed Fishery
- Abalone Fishery
- Gascoyne Demersal Scalefish
- Onslow Prawn Fishery
- Marine Aquarium Managed Fishery
- Pilbara Crab Fishery
- Pilbara Fish Trawl Fishery
- Pilbara Trap Fishery
- Shark Bay Prawn Fishery
- Shark Bay Scallop Fishery
- South West Coast Salmon Fishery
- Specimen Shell Fishery
- West Coast Deep Sea Crustacean Fishery
- West Coast Rock Lobster Fishery

Fishing effort does not occur in all of these zones and is dependent on habitat types and fishing methods. For example, the Pearl Oyster Managed Fishery involves hand harvest using drift diving and so does not occur within the deep waters of the Operational Area and EMBA.

The state fisheries of Western Australia are managed by the adherence to specific management plans, regulations and a variety of subsidiary regulatory instruments under the *Fish Resources Management Act 1994* (WA). Based on information received from consultation with DPIRD - Fisheries, there are two species that may undertake spawning or reproductive behaviours within the Operational Area (Table 4-1:).

Table 4-1: Key fisheries species spawning timing* (green cells) relevant to the Gascoyne region

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sandbar shark *Carcharhinus plumbeus*												
Blacktip shark *Carcharhinus metlanopterus*												

Notes: * spawning timing provided by DPIRD - Fisheries during the stakeholder consultation process

4.2 TOURISM

Marine tourism and recreational activities tend to be concentrated in the vicinity of population centres along the WA coastline. The EMBA does not reach a shoreline however the closest population centres to the boundary of the EMBA are Exmouth (approximately 31 km southeast from the edge of EMBA) and Coral Bay (approximately 45 km). Tourism contributes to State and local economies in terms of both income and employment. Popular water-based activities include fishing, swimming, snorkelling/diving, wildlife-watching and boating.

The population centres nearest to the Operational Area are Exmouth (approximately 150 km) and Onslow (approximately 180 km). Exmouth has become a significant tourist centre based in large part on the natural resources contained in the Cape Range National Park, Ningaloo Marine Park and adjacent inshore waters. Onslow is a coastal town offering easy access to tourists, vacationers and recreational fishers to the Mackerel Islands, a group of ten islands 22 km offshore.

Visitors partaking in tourism and recreational activities stay at the many coastal parks, camping grounds and caravan parks the Ningaloo Marine Park has to offer, such as at Jurabi Point, Mangrove Bay, Turquoise Bay and Yardie Creek. Popular tourist locations of interest include the many sanctuary zones along the Ningaloo coastline, such as Mangrove Bay, Jurabi Point, Turquoise Bay and Oyster Stacks, where visitors can enjoy bird-watching opportunities at Mangrove Bay. The Turtle Centre at Jurabi is a popular tourist attraction and snorkelling is a popular activity for visitors in the numerous embayments such as at Turquoise Bay, and further south at the popular coastal town of Coral Bay. The most popular offshore tourism activities are fishing, diving and whale shark spotting.

4.3 OIL AND GAS INDUSTRY

The NWS is Australia's most prolific oil and gas production area, largely responsible for WA accounting for 66% of the country's oil production, 76% of the country's condensate production and 37% of the country's gas production in 2013 (APPEA, 2014).

Oil and gas activities within the EMBA include:

- Chevron's Jansz/Io
- Woodside's Scarborough.
- John Brooks' Platform
- Woodside's Pyrenees Development

4.4 COMMERCIAL SHIPPING

The Australian Maritime Safety Authority (AMSA) has established a network of shipping fairways off the north coast of Western Australia (AMSA, 2012). The shipping fairways are intended to reduce the risk of collision between transiting vessels and offshore infrastructure. The fairways are intended to direct large vessels such as bulk carriers and liquefied natural gas ships trading to the major ports into pre-defined routes to keep them clear of existing and planned offshore infrastructure. Use of the new fairways is strongly recommended but not mandatory.

There are several declared and charted shipping fairways which intersect within Operational Area and the EMBA. The operational area lies outside of these declared and charted shipping fairways (Section 4.4.7 in the EP). The nearest shipping route heading northeast is around 30 km north of the operational area.

4.5 CULTURAL HERITAGE

4.5.1 Indigenous Heritage

Aboriginal sites are of immense cultural, scientific, educational and historic interest and provide an important connection between Aboriginal people and their present and future culture. The Indigenous peoples have ongoing relationship with coastal and marine environments and resources as part of cultural identity, health, wellbeing, and domestic and commercial economies (DEWHA, 2008). Ongoing connections are demonstrated through fishing, hunting and the maintenance of maritime cultures and heritage through ritual, stories and application of traditional knowledge. Although direct use of deeper offshore waters is limited, direct cultural interest in decisions affecting the management of these waters exists.

A search through the Aboriginal Heritage Inquiry System determined the coastal areas that have a long history of occupancy by Indigenous communities (i.e. Barrow Island, Montebello Islands, Exmouth, Ningaloo Reef, the Kimberley Coast) were outside of the EMBA. The search also determined there are no registered Aboriginal Heritage sites within the operational area.

Aboriginal heritage sites in WA are protected under the *Aboriginal Heritage Act 1972*, whether or not they are registered with Department of Planning, Lands and Heritage. While sea country is a recognised value, the registered site list contains only land-based sites. Areas covered by registered native title claims are likely to practice indigenous fishing techniques at various sections of the WA coastline.

Indigenous Protected Areas (IPA) are a component of the National Reserve System, which is the network of formally recognised parks, reserves and protected areas across Australia. IPAs are areas of land and sea country owned or managed by Indigenous groups, which are voluntarily managed as a protected area for biodiversity conservation through an agreement with the Australian Government. No IPAs intersect the operational area or the EMBA.

4.5.2 Underwater Cultural Heritage

The *Underwater Cultural Heritage Act 2018* protects Australia's underwater cultural heritage, including shipwrecks, sunken aircraft and other types of underwater heritage. Under this Act, shipwrecks, sunken aircraft and their associated artefacts older than 75 years are protected. Shipwrecks dating pre-1900 are protected under the *Maritime Archaeology Act 1973*. There are more than 1500 known shipwreck and historic (more than 75 years old) shipwreck and sunken aircraft sites listed to occur within Commonwealth waters offshore WA, as listed in the Australasian Underwater Cultural Heritage Database.

The Underwater Cultural Heritage Database was searched to identify any known shipwrecks protected under the *Underwater Cultural Heritage Act 2018*. There are no known historic shipwrecks within the operational area or the EMBA.

In addition to the general protection provided to underwater heritage sites, the *Underwater Cultural Heritage Act 2018* also provides that an area containing protected underwater heritage may be declared a protected zone. These zones may be established for many reasons, including conservation, management or public safety considerations. For example, sites may contain unexploded military ordnance or unstable structures, or require active management because the underwater heritage and its environment are particularly fragile or sensitive. Figure 4-6 shows Australian locations of Underwater Cultural Heritage Shipwreck Protected Zones. No Underwater Cultural Heritage Shipwreck Protected Zones overlap the operational area, nor do any Underwater Cultural Heritage Shipwreck Protected Zones overlap with the EMBA.

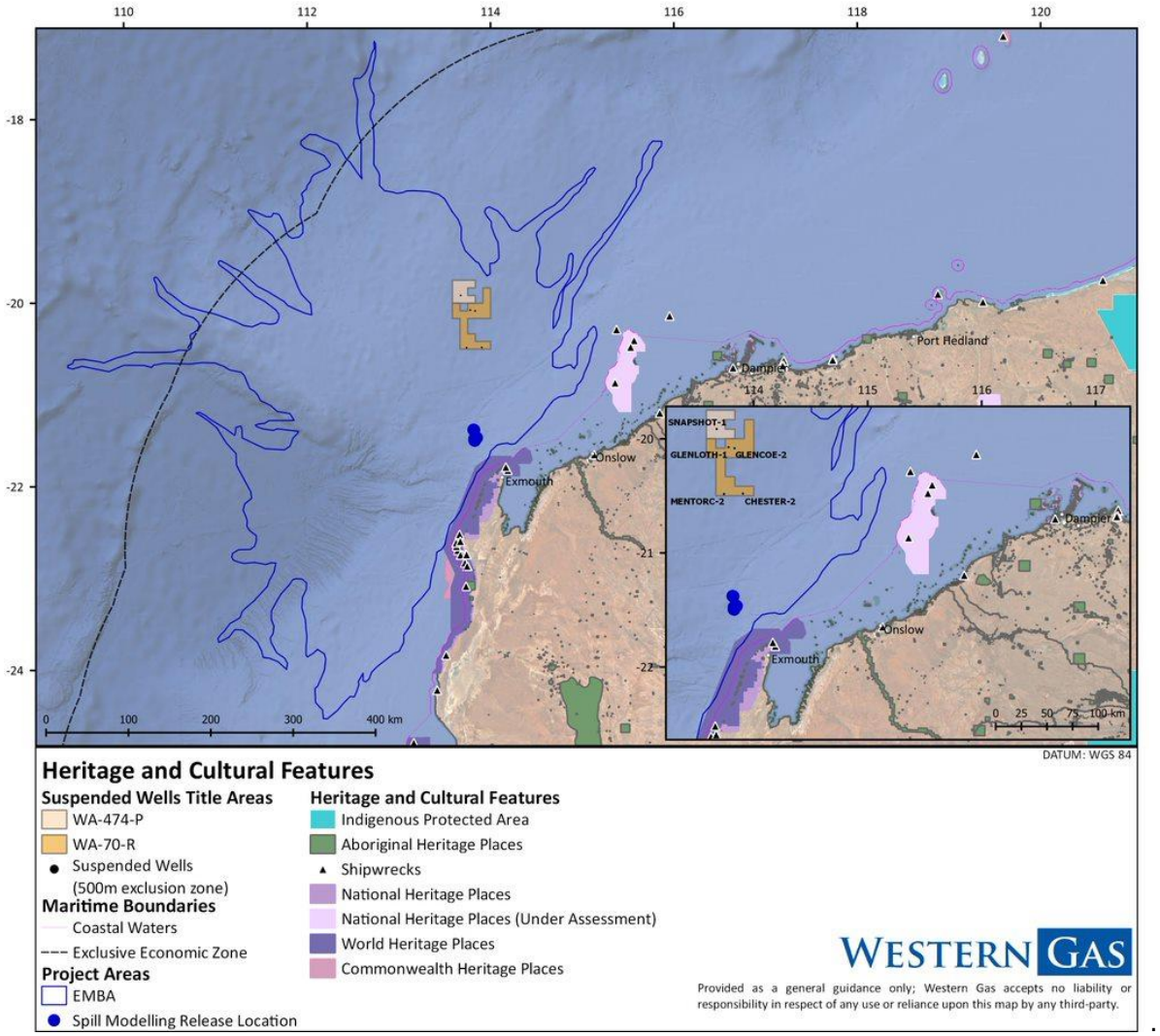

Figure 4-6: Heritage and Culture Features within the EMBA

4.6 DEFENCE

The Naval Communication Station Harold E. Holt is located on the northwest coast of Australia, 6 km north of the town of Exmouth, WA. Exmouth was built at the same time as the communications station to support the base and to house dependent families of United States of America Navy personnel (GDC, 2021).

The station provides very low frequency radio transmission to United States of America Navy and Royal Australian Navy ships and submarines in the western Pacific Ocean and eastern Indian Ocean. With a transmission power of 1 megawatt, it is the most powerful transmission station in the southern hemisphere (GDC, 2021).

The Royal Australian Air Force Base Learmonth is located on the North West Cape, around 30 km south of Exmouth. It is one of the Air Force's three bases that can be used for exercises or operational requirements (GDC, 2021).

The operational area is within the North Western Training Area and military restricted airspace (R8541A) a designated defence exercise area which encompasses waters and airspace off the North West Cape (Figure 2-28). When activated by a 'Notice to Airmen', the restricted airspace can operate down to sea level.

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APPENDIX D: EPBC PROTECTED MATTERS REPORT

Australian Government
Department of Climate Change, Energy, the Environment and Water

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: 16-Nov-2022

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:	31
Listed Migratory Species:	49

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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	78
Whales and Other Cetaceans:	32
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	5
Habitat Critical to the Survival of Marine Turtles:	3

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:	None
EPBC Act Referrals:	127
Key Ecological Features (Marine):	4
Biologically Important Areas:	11
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
EEZ and Territorial Sea
Extended Continental Shelf

Listed Threatened Species [Resource Information]

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

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
FISH		
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
REPTILE		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
SHARK		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area

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

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Foraging, feeding or related behaviour likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptile		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Leioselasma czeblukovi as Hydrophis czeblukovi		
Fine-spined Seasnake, Geometrical Seasnake [87374]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Pelamis platurus		
Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis		
Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis		
Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Orcaella heinsohni as Orcaella brevirostris Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Carnarvon Canyon	Habitat Protection Zone (IUCN IV)
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Gascoyne	National Park Zone (IUCN II)

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Nov - May		
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Project Highclere Cable Lay and Operation	2022/09203		Completed
Controlled action			
'Van Gogh' Petroleum Field Development	2007/3213	Controlled Action	Post-Approval
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston	2008/4469	Controlled Action	Post-Approval
Develop Jansz-Io deepwater gas field in Permit Areas WA-18-R, WA-25-R and WA-26-	2005/2184	Controlled Action	Post-Approval
Development of Coniston/Novara fields within the Exmouth Sub-basin	2011/5995	Controlled Action	Post-Approval
Development of Stybarrow petroleum field incl drilling and facility installation	2004/1469	Controlled Action	Post-Approval
Enfield full field development	2001/257	Controlled Action	Post-Approval
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Gorgon Gas Development	2003/1294	Controlled Action	Post-Approval
Gorgon Gas Development 4th Train Proposal	2011/5942	Controlled Action	Post-Approval
Greater Enfield (Vincent) Development	2005/2110	Controlled Action	Post-Approval
Nava-1 Cable System	2001/510	Controlled Action	Completed
Pluto Gas Project	2005/2258	Controlled Action	Completed
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval
Pyrenees Oil Fields Development	2005/2034	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
The Scarborough Project - FLNG & assoc subsea infrastructure, Carnarvon Basin	2013/6811	Controlled Action	Post-Approval
Vincent Appraisal Well	2000/22	Controlled Action	Post-Approval
Not controlled action			
'Van Gogh' Oil Appraisal Drilling Program, Exploration Permit Area WA-155-P(1)	2006/3148	Not Controlled Action	Completed
APX-West Fibre-optic telecommunications cable system, WA to Singapore	2013/7102	Not Controlled Action	Completed
Bollinger 2D Seismic Survey 200km North of North West Cape WA	2004/1868	Not Controlled Action	Completed
Bultaco-2, Laverda-2, Laverda-3 and Montesa-2 Appraisal Wells	2000/103	Not Controlled Action	Completed
Carnarvon 3D Marine Seismic Survey	2004/1890	Not Controlled Action	Completed
Cazadores 2D seismic survey	2004/1720	Not Controlled Action	Completed
Construction and operation of an unmanned sea platform and connecting pipeline to Varanus Island for	2004/1703	Not Controlled Action	Completed
Controlled Source Electromagnetic Survey	2007/3262	Not Controlled Action	Completed
Development of Halyard Field off the west coast of WA	2010/5611	Not Controlled Action	Completed
Exploration drilling well WA-155-P(1)	2003/971	Not Controlled Action	Completed
Exploration of appraisal wells	2006/3065	Not Controlled Action	Completed
Exploration Well in Permit Area WA-155-P(1)	2002/759	Not Controlled Action	Completed
Exploratory drilling in permit area WA-225-P	2001/490	Not Controlled Action	Completed
HCA05X Macedon Experimental Survey	2004/1926	Not Controlled Action	Completed
Hess Exploration Drilling Programme	2007/3566	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
INDIGO West Submarine Telecommunications Cable, WA	2017/8126	Not Controlled Action	Completed
Jansz-2 and 3 Appraisal Wells	2002/754	Not Controlled Action	Completed
Montesa-1 and Bultaco-1 Exploration Wells	2000/102	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline	2005/2033	Not Controlled Action	Completed
To construct and operate an offshore submarine fibre optic cable, WA	2014/7373	Not Controlled Action	Completed
Wanda Offshore Research Project, 80 km north-east of Exmouth, WA	2018/8293	Not Controlled Action	Completed
Wheatstone 3D seismic survey, 70km north of Barrow Island	2004/1761	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
"Leanne" offshore 3D seismic exploration, WA-356-P	2005/1938	Not Controlled Action (Particular Manner)	Post-Approval
2D and 3D seismic surveys	2005/2151	Not Controlled Action (Particular Manner)	Post-Approval
2D marine seismic survey	2012/6296	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey	2008/4493	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey	2008/4281	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P	2003/1271	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey over petroleum title WA-268-P	2007/3458	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Surveys - Contos CT-13 & Supertubes CT-13, offshore WA	2013/6901	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic survey	2006/2715	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey, WA	2008/4428	Not Controlled Action (Particular Manner)	Post-Approval
Acheron Non-Exclusive 2D Seismic Survey	2008/4565	Not Controlled Action (Particular Manner)	Post-Approval
Acheron Non-Exclusive 2D Seismic Survey	2009/4968	Not Controlled Action (Particular Manner)	Post-Approval
Agrippina 3D Seismic Marine Survey	2009/5212	Not Controlled Action (Particular Manner)	Post-Approval
Apache Northwest Shelf Van Gogh Field Appraisal Drilling Program	2007/3495	Not Controlled Action (Particular Manner)	Post-Approval
Aperio 3D Marine Seismic Survey, WA	2012/6648	Not Controlled Action (Particular Manner)	Post-Approval
Australia to Singapore Fibre Optic Submarine Cable System	2011/6127	Not Controlled Action (Particular Manner)	Post-Approval
Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA	2013/7081	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Balnaves Condensate Field Development	2011/6188	Not Controlled Action (Particular Manner)	Post-Approval
Bonaventure 3D seismic survey	2006/2514	Not Controlled Action (Particular Manner)	Post-Approval
Cable Seismic Exploration Permit areas WA-323-P and WA-330-P	2008/4227	Not Controlled Action (Particular Manner)	Post-Approval
CGGVERITAS 2010 2D Seismic Survey	2010/5714	Not Controlled Action (Particular Manner)	Post-Approval
Charon 3D Marine Seismic Survey	2007/3477	Not Controlled Action (Particular Manner)	Post-Approval
Coverack Marine Seismic Survey	2001/399	Not Controlled Action (Particular Manner)	Post-Approval
CVG 3D Marine Seismic Survey	2012/6654	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Drilling Program	2010/5532	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Draeck 3D Marine Seismic Survey, WA-205-P	2006/3067	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Drilling 35-40 offshore exploration wells in deep water	2008/4461	Not Controlled Action (Particular Manner)	Post-Approval
Eendracht Multi-Client 3D Marine Seismic Survey	2009/4749	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M3 & Vincent 4D Marine Seismic Surveys	2008/3981	Not Controlled Action (Particular Manner)	Completed
Enfield M3 4D, Vincent 4D & 4D Line Test Marine Seismic Surveys	2008/4122	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M4 4D Marine Seismic Survey	2008/4558	Not Controlled Action (Particular Manner)	Post-Approval
Enfield oilfield 3D Seismic Survey	2006/3132	Not Controlled Action (Particular Manner)	Post-Approval
Exmouth West 2D Marine Seismic Survey	2008/4132	Not Controlled Action (Particular Manner)	Post-Approval
Foxhound 3D Non-Exclusive Marine Seismic Survey	2009/4703	Not Controlled Action (Particular Manner)	Post-Approval
Geco Eagle 3D Marine Seismic Survey	2008/3958	Not Controlled Action (Particular Manner)	Post-Approval
Glencoe 3D Marine Seismic Survey WA-390-P	2007/3684	Not Controlled Action (Particular Manner)	Post-Approval
Guacamole 2D Marine Seismic Survey	2008/4381	Not Controlled Action (Particular Manner)	Post-Approval
Harmony 3D Marine Seismic Survey	2012/6699	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Honeycombs MC3D Marine Seismic Survey	2012/6368	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA	2013/7003	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA	2013/7093	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
John Ross & Rosella Off Bottom Cable Seismic Exploration Program	2008/3966	Not Controlled Action (Particular Manner)	Post-Approval
Julimar Brunello Gas Development Project	2011/5936	Not Controlled Action (Particular Manner)	Post-Approval
Klimt 2D Marine Seismic Survey	2007/3856	Not Controlled Action (Particular Manner)	Post-Approval
Laverda 3D Marine Seismic Survey and Vincent M1 4D Marine Seismic Survey	2010/5415	Not Controlled Action (Particular Manner)	Post-Approval
Laying a submarine optical fibre telecommunications cable, Perth to Singapore and Jakarta	2014/7332	Not Controlled Action (Particular Manner)	Post-Approval
Leopard 2D marine seismic survey	2005/2290	Not Controlled Action (Particular Manner)	Post-Approval
Lion 2D Marine Seismic Survey	2007/3777	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Marine reconnaissance survey	2008/4466	Not Controlled Action (Particular Manner)	Post-Approval
Moosehead 2D seismic survey within permit WA-192-P	2005/2167	Not Controlled Action (Particular Manner)	Post-Approval
Munmorah 2D seismic survey within permits WA-308/9-P	2003/970	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Program, WA-264-P	2007/3844	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Survey	2005/2017	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Canning Multi Client 2D Marine Seismic Survey	2010/5393	Not Controlled Action (Particular Manner)	Post-Approval
Orcus 3D Marine Seismic Survey in WA-450-P	2010/5723	Not Controlled Action (Particular Manner)	Post-Approval
Osprey and Dionysus Marine Seismic Survey	2011/6215	Not Controlled Action (Particular Manner)	Post-Approval
Palta-1 exploration well in Petroleum Permit Area WA-384-P	2011/5871	Not Controlled Action (Particular Manner)	Post-Approval
Pomodoro 3D Marine Seismic Survey in WA-426-P and WA-427-P	2010/5472	Not Controlled Action (Particular Manner)	Post-Approval
Pyrenees 4D Marine Seismic Monitor Survey, HCA12A	2012/6579	Not Controlled Action (Particular Manner)	Post-Approval
Pyrenees-Macedon 3D marine seismic survey	2005/2325	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Quiberon 2D Seismic Survey, permit area WA-385P, offshore of Carnarvon	2009/5077	Not Controlled Action (Particular Manner)	Post-Approval
Rydal-1 Petroleum Exploration Well, WA	2012/6522	Not Controlled Action (Particular Manner)	Post-Approval
Salsa 3D Marine Seismic Survey	2010/5629	Not Controlled Action (Particular Manner)	Post-Approval
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
Skorpion Marine Seismic Survey WA	2001/416	Not Controlled Action (Particular Manner)	Post-Approval
Sovereign 3D Marine Seismic Survey	2011/5861	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow 4D Marine Seismic Survey	2011/5810	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow Baseline 4D marine seismic survey	2008/4530	Not Controlled Action (Particular Manner)	Post-Approval
Tortilla 2D Seismic Survey, WA	2011/6110	Not Controlled Action (Particular Manner)	Post-Approval
Triton 3D Marine Seismic Survey, WA-2-R and WA-3-R	2006/2609	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5679	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Vincent M1 and Enfield M5 4D Marine Seismic Survey	2010/5720	Not Controlled Action (Particular Manner)	Post-Approval
Warramunga Non-Inclusive 3D Seismic Survey	2008/4553	Not Controlled Action (Particular Manner)	Post-Approval
West Anchor 3D Marine Seismic Survey	2008/4507	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone 3D MAZ Marine Seismic Survey	2011/6058	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2007/3941	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2008/4134	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Bianchi 3D Marine Seismic Survey, Carnavon Basin, WA	2013/7078	Referral Decision	Completed
CVG 3D Marine Seismic Survey	2012/6270	Referral Decision	Completed
Enfield 4D Marine Seismic Surveys, Production Permit WA-28-L	2005/2370	Referral Decision	Completed
Stybarrow Baseline 4D Marine Seismic Survey (Permit Areas WA-255-P, WA-32-L, WA-	2008/4165	Referral Decision	Completed

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	North-west
Continental Slope Demersal Fish Communities	North-west
Exmouth Plateau	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Migration	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur

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 are 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

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

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

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
- 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.

APPENDIX E: RELEVANT PERSONS SAMPLE ACTIVITY INFORMATION

Example of explanatory cover email

The email provided below demonstrates Western Gas' consultation approach where activity impacts and risks are expected.

Dear [relevant person]

Western Gas is a Western Australian company with natural gas interests in the North West Shelf. We hold acreage including petroleum titles WA-70-R and WA-474-P, which contain four abandoned wells and one suspended well.

The wells are approximately 180 km northwest of Onslow and 150 km north of Exmouth, Western Australia.

Activity

Western Gas plans to leave the four abandoned wellheads in situ, as well as conduct annual vessel-based wellhead surveys for the suspended well. The survey will involve a few days of vessel operations each year at the suspended well location.

All wells are in Commonwealth Waters approximately 180 km northwest of Onslow and 150 km north of Exmouth, Western Australia at water depths between 1,116 and 1,131 metres.

Further information is provided in the attached information sheet, which is also available on our web site at westerngas.com.au/consultation.

Consultation

As with all offshore petroleum activities in Commonwealth Waters, impacts and potential risks associated with these activities will be assessed and managed through regulatory processes under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) and associated Regulations.

Western Gas has identified [relevant person] as a relevant person for consultation under these arrangements, given the potential for impacts to [function, activity or interest]. As such, we seek any claims or objections you may have about proposed activities.

A map showing WA-70-R and WA-474-P relative to [function, activity or interest] is attached for context.

We have also assessed that [functions, activities or interests] may be impacted in the unlikely occurrence of a marine pollution incident and seek your cooperation to develop communications protocols as part of marine pollution response preparedness.

Providing feedback – planned activities

Western Gas will assess the merits of any claims or objections you may have and will provide you with a response on how this assessment has been considered in activity planning.

A summary of your feedback and our response will be included in an Environment Plan under which all activities are proposed to be managed. This Plan will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment and must be accepted by NOPSEMA before any activities outlined in the Plan can take place.

Providing feedback – marine pollution

For this activity, we have determined a 250 m^3 marine diesel oil spill to be the worst-case credible spill scenario. This volume has been selected based on a vessel collision and resulting loss of containment from a fuel tank of a typical support vessel that will be used for the suspended wellhead surveys. This hydrocarbon volume and type were then modelled using a number of hypothetical spills under different environmental conditions to determine the widest extent of possible oil dispersion.

Can you please provide appropriate emergency response contact details for inclusion in our Oil Pollution Emergency Plan for proposed activities to ensure effective and timely emergency response in the event of a spill, as well as to establish communications protocols for future activities in the region.

We would also be pleased to discuss any appropriate communications arrangements specific to your information and reporting needs.

Feedback Date

Please provide feedback by **5 December 2022** to ensure we have sufficient time to respond and incorporate your feedback into planning activities for the development of the Environment Plan.

Please let us know if you wish your personal/organisation details or any part of your feedback to remain confidential to NOPSEMA.

We also request early engagement should you require additional information to help understand if proposed activities may impact your functions, activities or interests.

Example of explanatory cover email

The email provided below demonstrates Western Gas' consultation approach where activity risks only are expected.

Dear [relevant person]

Western Gas is a Western Australian company with natural gas interests in the North West Shelf. We hold acreage including petroleum titles WA-70-R and WA-474-P, which contain four abandoned wells and one suspended well.

The wells are approximately 180 km northwest of Onslow and 150 km north of Exmouth, Western Australia.

Activity

Western Gas plans to leave the four abandoned wellheads in situ, as well as conduct annual vessel-based wellhead surveys for the suspended well. The survey will involve a few days of vessel operations each year at the suspended well location.

All wells are in Commonwealth Waters approximately 180 km northwest of Onslow and 150 km north of Exmouth, Western Australia at water depths between 1,116 and 1,131 metres.

Further information is provided in the attached information sheet, which is also available on our web site at westerngas.com.au/consultation.

Consultation

As with all offshore petroleum activities in Commonwealth Waters, impacts and potential risks associated with these activities will be assessed and managed through regulatory processes under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) and associated Regulations.

While planned activities are unlikely to impact the activities of any [socio economic activity] given the location of the wells and water depths, we have assessed that your functions, activities or interests may be impacted in the unlikely occurrence of a marine pollution incident and seek your cooperation to develop communications protocols as part of marine pollution response preparedness.

Providing feedback – marine pollution

We have identified that the following [socio economic activity] as being within the widest extent of possible oil dispersion:

[Details provided]

We seek your concurrence that consulting [relevant stakeholder] on behalf of [organisations] is appropriate at this time, acknowledging that not all [organisations] with activities or interests within the extent of the potentially impacted area would be affected in the event of an actual spill.

We also would be pleased to discuss appropriate communications arrangements for inclusion in our Oil Pollution Emergency Plan to ensure effective and timely emergency response in the event of a spill, as well as on how information is communicated to you where licence holders may be impacted, as well as how best to consult individual licence holders.

Feedback Date

Please provide feedback by **10 December 2022** to ensure we have sufficient time to respond and incorporate your feedback into planning activities for the development of the Environment Plan.

A summary of your feedback and our response will be included in an Environment Plan under which all activities are proposed to be managed. This Plan will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment and must be accepted by NOPSEMA before any activities outlined in the Plan can take place.

Please let us know if you wish your personal/organisation details or any part of your feedback to remain confidential to NOPSEMA.

We also request early engagement should you require additional information to help understand if proposed activities may impact your functions, activities or interests.

Initial consultation information sheet

WESTERN GAS

STAKEHOLDER CONSULTATION INFORMATION SHEET

NOVEMBER 2022

WA-474-P, WA-70-R ABANDONED AND SUSPENDED WELLS ENVIRONMENT PLAN

CARNARVON BASIN, NORTH-WEST AUSTRALIA

ACTIVITY

Western Gas is planning to permanently leave *in situ* a total of four subsea wellheads associated with four abandoned exploration wells, namely Chester-2, Glencoe-2, Mentorc-2 and Snapshot-1 in Petroleum Permits WA-70-R and WA-474-P.

Plugging and abandonment of these wells has already occurred, as described in the Government-accepted Well Operations Management Plan (WOMP) and Well Abandonment Reports for each well.

In addition, the Glenloth-1 well is to remain as a suspended well. Western Gas is proposing to undertake annual vessel-based wellhead survey activities on the suspended well, which is located in Petroleum Permit WA-70-R.

All wells are located approximately 180 km northwest of Onslow and 150 km north of Exmouth, Western Australia at water depths between 1,116 and 1,131 metres.

An Environment Plan for the proposed activities will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment, covering the *in situ* abandoned wellheads, the suspended well, and the vessel-based inspection survey.

Western Gas is Operator and 100% owner of WA-474-P and WA-70-R.

Western Gas welcomes feedback from stakeholders whose functions, activities or interests may be impacted by activities outlined in this Information Sheet. Please provide feedback by close of business on 5 December 2022.

Activity location

WESTERN GAS

SUSPENDED WELLHEAD SURVEY OVERVIEW	
Wellhead name:	Glenloth-1
Petroleum Permit:	WA-70-R
Commencement date:	Annually
Approximate estimated duration:	Up to seven days, including contingencies
Approximate location:	20° 04′ 23.9" S 113° 46′ 46.258" E
Approximate water depth:	1,116.53 m MDSS
Infrastructure:	Wellhead – 98% steel, approx 3m x 3m
Operational area:	500-metre zone from the wellhead
Vessels:	Small utility vessel or similar
Distance to nearest town:	Approx. 150 km northwest of Exmouth
Distance to nearest marine park:	Approx. 70 km north of Gascoyne

PERMANENT ABANDONMENT OF WELLHEADS IN-SITU OVERVIEW				
Wellhead name:	Chester-2	Glencoe-2H	Mentorc-2	Snapshot-1
Petroleum Permit:	WA-70-R	WA-70-R	WA-70-R	WA-474-P
Approximate duration:	Presence will be ongoing	Presence will be ongoing	Presence will be ongoing	Presence will be ongoing
Approximate locations:	20° 28' 48.528" S 113° 54' 20.136" E	20° 4′ 57.23" S 113° 49′ 55.4" E	20° 29′ 0.344" S 113° 44′ 22.35" E	19° 54' 49.451" S 113° 40′ 31.074" E
Approximate water depth:	1,125 m MDSS	1,116 m MDSS	1,131 m MDSS	1,121 m MDSS
Infrastructure:	Wellhead – 98% steel, approx. 3 m x 3 m	Wellhead – 98% steel, approx. 3 m x 3 m	Wellhead – 98% steel, approx. 3 m x 3 m	Wellhead – 98% steel, approx. 3 m x 3 m
Distance to nearest town:	Approx. 170 km northwest of Exmouth	Approx. 220 km northwest of Exmouth	Approx. 180 km northwest of Exmouth	Approx. 230 km northwest of Exmouth
Distance to nearest marine park:	Approx. 30 km north of Gascoyne Marine Park	Approx. 70 km north of Gascoyne Marine Park	Approx. 25 km north of Gascoyne Marine Park	Approx. 88 km north of Gascoyne Marine Park

WESTERN GAS

ACTIVITY DETAILS

Abandoned Wells

The presence of the four permanently abandoned wellheads in-situ will be ongoing and no further work will be required as part of proposed activities under the Environment Plan, as the integrity of the wells has been demonstrated through the WOMP and Well Abandonment process.

Suspended Well

Vessel-based surveys will be undertaken to inspect the suspended Glenloth-1 well and assist with the assessment of decommissioning options.

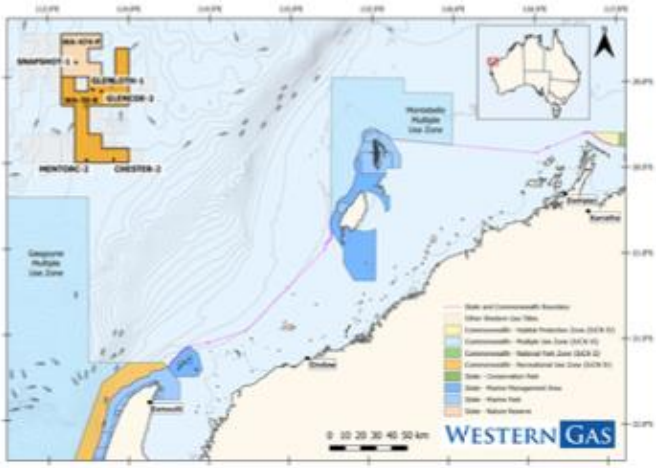
This survey will be undertaken annually from acceptance of the Environment Plan and may be undertaken at a time when Western Gas is performing other Petroleum Activities in the area.

The inspection survey will be undertaken using a remotely operated vehicle (ROV) deployed from a small utility vessel. The survey may take up to 7 days, including time for contingencies. The ROV inspection of the wellhead itself is expected to take approximately 4 hours.

To assist in locating the wellhead, the ROV will use various geophysical and hydrographic survey techniques such as Multibeam echo-sounder (MBES), Side-scan Sonar (SSS), Ultra-short Baseline System (USBL) and General Video Inspection (GVI).

At this time, the small utility vessel that will be used to undertake inspection survey activity has not been identified, however would typically be less than 30 m in length and support a crew of approximately 15 persons.

Vessels will be fuelled by marine diesel fuel, and there is no planned vessel refuelling to take place in the operational area. All vessel fuelling is proposed to take place within the nearest suitable harbour.



Activity location

ACTIVITY ASSESSMENT AND POTENTIAL IMPACTS

Western Gas has undertaken a comprehensive assessment of the four abandoned wellheads considering water depth, potential interaction with other marine users, and impacts and risks associated with the removal of the wellheads.

This assessment determined that leaving the wellheads *in situ* presented an equal or better environmental outcome compared to the regulatory base case of removing the wellheads.

Western Gas also considered potential impacts from the conduct of the vessel-based inspection survey for the suspended Glenloth-1 well.

Both assessments considered impacts to physical, ecological, social, economic, and cultural values and sensitivities based on a wide range of impact criteria. The outcome of the assessments will be provided in detail in the Environment Plan. A summary of key impacts and management measures is outlined in **Table 1** and **Table 2**.

Impacts from the vessel transiting to and from the operational area have not been included in the assessment scope of the Environment Plan.

WESTERN GAS

Table 1. Summary of key impacts

ACTIVITY	POTENTIAL RISKS AND/OR IMPACTS	ASSESSMENT	MITIGATION AND/OR MANAGEMENT MEASURES
PRESENCE OF THE WELLHEADS	**PHYSICAL**		
	Physical presence of the wellheads may cause interference.	Minor potential impact given water depth and distance from shore.	Consultation with maritime safety agencies. Wellhead locations marked on marine charts.
	Physical presence of the wellheads may cause snagging risks to trawl fisheries.	Minor potential impact as water depth is below that typically fished by trawl fishers.	Consultation with licence holders in the Western Deepwater Trawl Fishery, their representative organisation and relevant Commonwealth government agencies.
	ECOLOGICAL		
	Ecological values that may be impacted include: ■ Plankton ■ Fish ■ Marine mammals ■ State Protected Marine Values	There are little to no impacts associated to leaving the wellheads in-situ as there are no activities associated with this process.	No activity is associated with the process of leaving wellheads *in situ*.
	SOCIAL, ECONOMIC AND CULTURAL		
	Impacts to the functions, activities and interests of stakeholders relevant to: ■ Commercial fishing activities ■ Defence activities ■ Indigenous values ■ Petroleum activities ■ Shipping activities	There are little to no impacts associated to leaving the wellheads in-situ as there are no activities associated with this process.	Consultation with the following organisations to inform decision making for the proposed activity and development of the Environment Plan: ■ Commercial fishing licence holders and their representative organisations ■ Government Agencies ■ Indigenous representative bodies ■ Petroleum titleholders ■ Port authorities

WESTERN GAS

Table 2: Summary of key impacts

ACTIVITY	POTENTIAL RISKS AND/OR IMPACTS	ASSESSMENT	MITIGATION AND/OR MANAGEMENT MEASURES
VESSEL-BASED SURVEYS	**PHYSICAL**		
	Physical presence of the vessel may cause interference or displacement.	The potential impacts are predicted to be minor due to distance from shore.	Wellhead locations marked on marine charts.
	ECOLOGICAL		
	Ecological values that may be impacted include: ■ Plankton ■ Fish ■ Marine mammals ■ State Protected Marine Values	The potential impacts are predicted to be minor due to the short duration of activities, water depth and distance from shore.	Vessel activities will be managed according to relevant legislation and guidelines.
	SOCIAL, ECONOMIC AND CULTURAL		
	Impacts to the functions, activities and interests of stakeholders relevant to: ■ Commercial fishing activities ■ Defence activities ■ Indigenous values ■ Petroleum activities ■ Shipping activities	Minor potential impact given: ■ Water depth ■ Distance from shore Short duration of activities compared to regional marine traffic.	Consultation with the following organisations to inform decision making for the proposed activity and development of the Environment Plan: ■ Commercial fishing licence holders and their representative organisations ■ Government Agencies ■ Indigenous representative bodies ■ Petroleum titleholders ■ Port authorities Notifications prior to the start and upon completion of the vessel inspection survey will be provided to the Australian Hydrographic Office to generate a Notice to Mariners. Notifications prior to the start and upon completion of the vessel inspection survey will be provided to other marine users if requested.

WESTERN GAS

STAKEHOLDER CONSULTATION

Planned activities

Western Gas is consulting relevant stakeholders to inform planning for the development of the Environment Plan for proposed activities. Relevant stakeholders have been determined using the following methodology:

- Identifying physical, environmental, social, economic, and cultural values and sensitivities that may be affected by planned activities.
- Identifying government agencies with management roles for the identified values and sensitivities.
- Identifying government agencies with management roles for the development of plans to support emergency situations, such as marine pollution.
- Identifying other stakeholders whose functions, activities or interests are relevant to the identified values and sensitivities.

Western Gas complements this regulatory consultation approach by way of regular engagement of stakeholders who have identified an interest in the development of our Equus gas fields and adjacent exploration interests.

Unplanned activities

Western Gas is also consulting relevant stakeholders to inform planning for the development of the Environment Plan for unplanned activities, specifically marine pollution.

Relevant stakeholders, in addition to those government agencies already identified as having a role in response activities, have been determined using the following methodology:

- Identifying physical, environmental, social, economic, and cultural values and sensitivities that may be affected by marine pollution based on modelling predictions from a worst-case marine pollution event.
- Identifying stakeholders whose functions, activities or interests maybe impacted based on potential impacts to the identified values and sensitivities.
- Where possible, consult organisations that represent the interests of potentially impacted stakeholders, acknowledging that not all stakeholders within the extent of the modelled impacted area will be affected in the event of an actual spill.
- Confirm with these organisations notifications and communications expectations in the event of a spill to ensure efficient and timely emergency response effort.
- Include these stakeholder expectations in the Oil Pollution Emergency Plan that will be developed for this Environment Plan, which will provide a detailed assessment of marine pollution risk, and response preparedness and planning.

For this activity, a credible worst-case marine pollution event would be a marine diesel oil spill comprising 250 m^3 marine diesel oil spill. This volume has been identified based on a vessel collision and resulting loss of containment from a fuel tank of a typical support vessel.

This hydrocarbon volume and type were then modelled using a number of hypothetical spills under different environmental conditions to determine the widest extent of possible oil dispersion.

PROVIDING FEEDBACK

Please contact us before **close of business on 5 December 2022** with your comments on proposed activities outlined in this information sheet.

Your feedback will be included in the Environment Plan for the proposed activities, which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Please let us know if wish your personal/organisation details or any part of your feedback to remain confidential as a summary of your feedback and our response in the Environment Plan for this activity will be published on NOPSEMA's web site.

Please contact Western Gas at:
feedback@westerngas.com.au

WESTERN GAS **Accelerating development of Western Australia's gas resources**

Example of explanatory cover email – activity update on marine pollution planning

The email provided below demonstrates Western Gas' where there are changes to activity planning or scope that may impact the functions, activities or interests of relevant persons.

Dear [relevant person]

Western Gas wishes to clarify details in our consultation information sheet previously provided to you on proposed activities in WA-70-R and WA-474-P.

Marine pollution response planning
Our information sheet described a worst-case credible marine pollution event being a marine diesel oil spill due to a vessel collision. The typical support vessel required for this activity would have a maximum fuel tank size of less than 250 m^3.

However, as a conservative measure, our modelling assessed a 1000 m3 marine diesel oil release, not a 250 m3 release as previously advised. This 1000 m3 volume was modelled using a number of hypothetical spills under different environmental conditions.

The widest extent of possible oil dispersion was then used to identify stakeholders whose functions, activities or interests may be impacted in the unlikely event of a spill, acknowledging that not all stakeholders identified would be impacted.

As per previous advice, we are keen to discuss appropriate communications arrangements for inclusion in our Oil Pollution Emergency Plan to support emergency response planning, as well as how information is communicated to you where your functions, activities or interests may be impacted.

For reference, the fact sheet previously sent to you has been updated to reflect the change in modelling approach and is attached.

Providing feedback – planned activities
More broadly we would also like to understand any claims or objections you may have about impacts to your functions, activities or interests from planned activities.

Feedback Date
Please note that feedback is due by close of business **5 December 2022** to ensure we have sufficient time to respond and incorporate your feedback into planning activities for the development of the Environment Plan.

Please let us know if you wish your personal/organisation details or any part of your feedback to remain confidential to NOPSEMA.

We also request early engagement should you require additional information to help understand if proposed activities may impact your functions, activities or interests.

Regards

Updated consultation information sheet (following a review of spill modelling)

WESTERN GAS

STAKEHOLDER CONSULTATION INFORMATION SHEET

NOVEMBER 2022

WA-474-P, WA-70-R ABANDONED AND SUSPENDED WELLS ENVIRONMENT PLAN

CARNARVON BASIN, NORTH-WEST AUSTRALIA

ACTIVITY

Western Gas is planning to permanently leave *in situ* a total of four subsea wellheads associated with four abandoned exploration wells, namely Chester-2, Glencoe-2, Mentorc-2 and Snapshot-1 in Petroleum Permits WA-70-R and WA-474-P.

Plugging and abandonment of these wells has already occurred, as described in the Government-accepted Well Operations Management Plan (WOMP) and Well Abandonment Reports for each well.

In addition, the Glenloth-1 well is to remain as a suspended well. Western Gas is proposing to undertake annual vessel-based wellhead survey activities on the suspended well, which is located in Petroleum Permit WA-70-R.

All wells are located approximately 180 km northwest of Onslow and 150 km north of Exmouth, Western Australia at water depths between 1,116 and 1,131 metres.

An Environment Plan for the proposed activities will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment, covering the *in situ* abandoned wellheads, the suspended well, and the vessel-based inspection survey.

Western Gas is Operator and 100% owner of WA-474-P and WA-70-R.

Western Gas welcomes feedback from stakeholders whose functions, activities or interests may be impacted by activities outlined in this Information Sheet. Please provide feedback by close of business on 5 December 2022.

Activity location

WESTERN GAS Accelerating development of Western Australia's gas resources

1

WESTERN GAS

SUSPENDED WELLHEAD SURVEY OVERVIEW	
Wellhead name:	Glenloth-1
Petroleum Permit:	WA-70-R
Commencement date:	Annually
Approximate estimated duration:	Up to seven days, including contingencies
Approximate location:	20° 04′ 23.9″ S 113° 46′ 46.258″ E
Approximate water depth:	1,116.53 m MDSS
Infrastructure:	Wellhead – 98% steel, approx 3m x 3m
Operational area:	500-metre zone from the wellhead
Vessels:	Small utility vessel or similar
Distance to nearest town:	Approx. 150 km northwest of Exmouth
Distance to nearest marine park:	Approx. 70 km north of Gascoyne

PERMANENT ABANDONMENT OF WELLHEADS IN-SITU OVERVIEW				
Wellhead name:	Chester-2	Glencoe-2H	Mentorc-2	Snapshot-1
Petroleum Permit:	WA-70-R	WA-70-R	WA-70-R	WA-474-P
Approximate duration:	Presence will be ongoing	Presence will be ongoing	Presence will be ongoing	Presence will be ongoing
Approximate locations:	20° 28′ 48.528″ S 113° 54′ 20.136″ E	20° 4′ 57.23″ S 113° 49′ 55.4″ E	20° 29′ 0.344″ S 113° 44′ 22.35″ E	19° 54′ 49.451″ S 113° 40′ 31.074″ E
Approximate water depth:	1,125 m MDSS	1,116 m MDSS	1,131 m MDSS	1,121 m MDSS
Infrastructure:	Wellhead – 98% steel, approx. 3 m x 3 m	Wellhead – 98% steel, approx. 3 m x 3 m	Wellhead – 98% steel, approx. 3 m x 3 m	Wellhead – 98% steel, approx. 3 m x 3 m
Distance to nearest town:	Approx. 170 km northwest of Exmouth	Approx. 220 km northwest of Exmouth	Approx. 180 km northwest of Exmouth	Approx. 230 km northwest of Exmouth
Distance to nearest marine park:	Approx. 30 km north of Gascoyne Marine Park	Approx. 70 km north of Gascoyne Marine Park	Approx. 25 km north of Gascoyne Marine Park	Approx. 88 km north of Gascoyne Marine Park

WESTERN GAS

ACTIVITY DETAILS

Abandoned Wells

The presence of the four permanently abandoned wellheads in-situ will be ongoing and no further work will be required as part of proposed activities under the Environment Plan, as the integrity of the wells has been demonstrated through the WOMP and Well Abandonment process.

Suspended Well

Vessel-based surveys will be undertaken to inspect the Glenloth-1 well and assist with the assessment of decommissioning options.

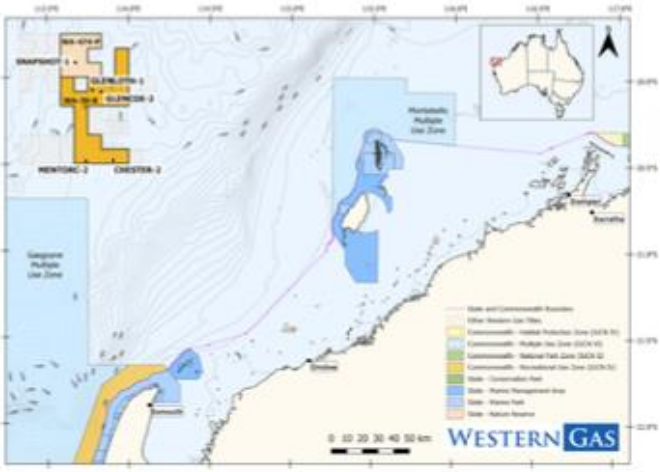
This survey will be undertaken annually from acceptance of the Environment Plan and may be undertaken at a time when Western Gas is performing other Petroleum Activities in the area.

The inspection survey will be undertaken using a remotely operated vehicle (ROV) deployed from a small utility vessel. The survey may take up to 7 days, including time for contingencies. The ROV inspection of the wellhead itself is expected to take approximately 4 hours.

To assist in locating the wellhead, the ROV will use various geophysical and hydrographic survey techniques such as Multibeam echo-sounder (MBES), Side-scan Sonar (SSS), Ultra-short Baseline System (USBL) and General Video Inspection (GVI).

At this time, the small utility vessel that will be used to undertake inspection survey activity has not been identified, however would typically be less than 30 m in length and support a crew of approximately 15 persons.

Vessels will be fuelled by marine diesel fuel, and there is no planned vessel refuelling to take place in the operational area. All vessel fuelling is proposed to take place within the nearest suitable harbour.



Activity location

ACTIVITY ASSESSMENT AND POTENTIAL IMPACTS

Western Gas has undertaken a comprehensive assessment of the four abandoned wellheads considering water depth, potential interaction with other marine users, and impacts and risks associated with the removal of the wellheads.

This assessment determined that leaving the wellheads *in situ* presented an equal or better environmental outcome compared to the regulatory base case of removing the wellheads.

Western Gas also considered potential impacts from the conduct of the vessel-based inspection survey for the suspended Glenloth-1 well.

Both assessments considered impacts to physical, ecological, social, economic, and cultural values and sensitivities based on a wide range of impact criteria. The outcome of the assessments will be provided in detail in the Environment Plan. A summary of key impacts and management measures is outlined in **Table 1** and **Table 2**.

Impacts from the vessel transiting to and from the operational area have not been included in the assessment scope of the Environment Plan.

WESTERN GAS

Table 1. Summary of key impacts

ACTIVITY	POTENTIAL RISKS AND/OR IMPACTS	ASSESSMENT	MITIGATION AND/OR MANAGEMENT MEASURES
PRESENCE OF THE WELLHEADS	**PHYSICAL**		
	Physical presence of the wellheads may cause interference.	Minor potential impact given water depth and distance from shore.	Consultation with maritime safety agencies. Wellhead locations marked on marine charts.
	Physical presence of the wellheads may cause snagging risks to trawl fisheries.	Minor potential impact as water depth is below that typically fished by trawl fishers.	Consultation with licence holders in the Western Deepwater Trawl Fishery, their representative organisation and relevant Commonwealth government agencies.
	ECOLOGICAL		
	Ecological values that may be impacted include: ■ Plankton ■ Fish ■ Marine mammals ■ State Protected Marine Values	There are little to no impacts associated to leaving the wellheads in-situ as there are no activities associated with this process.	No activity is associated with the process of leaving wellheads *in situ*.
	SOCIAL, ECONOMIC AND CULTURAL		
	Impacts to the functions, activities and interests of stakeholders relevant to: ■ Commercial fishing activities ■ Defence activities ■ Indigenous values ■ Petroleum activities ■ Shipping activities	There are little to no impacts associated to leaving the wellheads in-situ as there are no activities associated with this process.	Consultation with the following organisations to inform decision making for the proposed activity and development of the Environment Plan: ■ Commercial fishing licence holders and their representative organisations ■ Government Agencies ■ Indigenous representative bodies ■ Petroleum titleholders ■ Port authorities

WESTERN GAS

Table 2: Summary of key impacts

ACTIVITY	POTENTIAL RISKS AND/OR IMPACTS	ASSESSMENT	MITIGATION AND/OR MANAGEMENT MEASURES
VESSEL-BASED SURVEYS	**PHYSICAL**		
	Physical presence of the vessel may cause interference or displacement.	The potential impacts are predicted to be minor due to distance from shore.	Wellhead locations marked on marine charts.
	ECOLOGICAL		
	Ecological values that may be impacted include: ■ Plankton ■ Fish ■ Marine mammals ■ State Protected Marine Values	The potential impacts are predicted to be minor due to the short duration of activities, water depth and distance from shore.	Vessel activities will be managed according to relevant legislation and guidelines.
	SOCIAL, ECONOMIC AND CULTURAL		
	Impacts to the functions, activities and interests of stakeholders relevant to: ■ Commercial fishing activities ■ Defence activities ■ Indigenous values ■ Petroleum activities ■ Shipping activities	Minor potential impact given: ■ Water depth ■ Distance from shore Short duration of activities compared to regional marine traffic.	Consultation with the following organisations to inform decision making for the proposed activity and development of the Environment Plan: ■ Commercial fishing licence holders and their representative organisations ■ Government Agencies ■ Indigenous representative bodies ■ Petroleum titleholders ■ Port authorities Notifications prior to the start and upon completion of the vessel inspection survey will be provided to the Australian Hydrographic Office to generate a Notice to Mariners. Notifications prior to the start and upon completion of the vessel inspection survey will be provided to other marine users if requested.

WESTERN GAS

STAKEHOLDER CONSULTATION

Planned activities

Western Gas is consulting relevant stakeholders to inform planning for the development of the Environment Plan for proposed activities. Relevant stakeholders have been determined using the following methodology:

- Identifying physical, environmental, social, economic, and cultural values and sensitivities that may be affected by planned activities.
- Identifying government agencies with management roles for the identified values and sensitivities.
- Identifying government agencies with management roles for the development of plans to support emergency situations, such as marine pollution.
- Identifying other stakeholders whose functions, activities or interests are relevant to the identified values and sensitivities.

Western Gas complements this regulatory consultation approach by way of regular engagement of stakeholders who have identified an interest in the development of our Equus gas fields and adjacent exploration interests.

Unplanned activities

Western Gas is also consulting relevant stakeholders to inform planning for the development of the Environment Plan for unplanned activities, specifically marine pollution.

Relevant stakeholders, in addition to those government agencies already identified as having a role in response activities, have been determined using the following methodology:

- Identifying physical, environmental, social, economic, and cultural values and sensitivities that may be affected by marine pollution based on modelling predictions from a worst-case marine pollution event.
- Identifying stakeholders whose functions, activities or interests maybe impacted based on potential impacts to the identified values and sensitivities.
- Where possible, consult organisations that represent the interests of potentially impacted stakeholders, acknowledging that not all stakeholders within the extent of the modelled impacted area will be affected in the event of an actual spill.
- Confirm with these organisations notifications and communications expectations in the event of a spill to ensure efficient and timely emergency response effort.
- Include these stakeholder expectations in the Oil Pollution Emergency Plan that will be developed for this Environment Plan, which will provide a detailed assessment of marine pollution risk, and response preparedness and planning.

For this activity, the credible worst-case marine pollution event would be a marine diesel oil spill due to a vessel collision. The typical support vessel required for this activity would have a maximum fuel tank size of less than 250m^3. However, as a conservative measure, the marine diesel oil spill modelling assesses a 1000m^3 marine diesel oil release.

This hydrocarbon volume and type were then modelled using a number of hypothetical spills under different environmental conditions to determine the widest extent of possible oil dispersion.

PROVIDING FEEDBACK

Please contact us before **close of business on 5 December 2022** with your comments on proposed activities outlined in this information sheet.

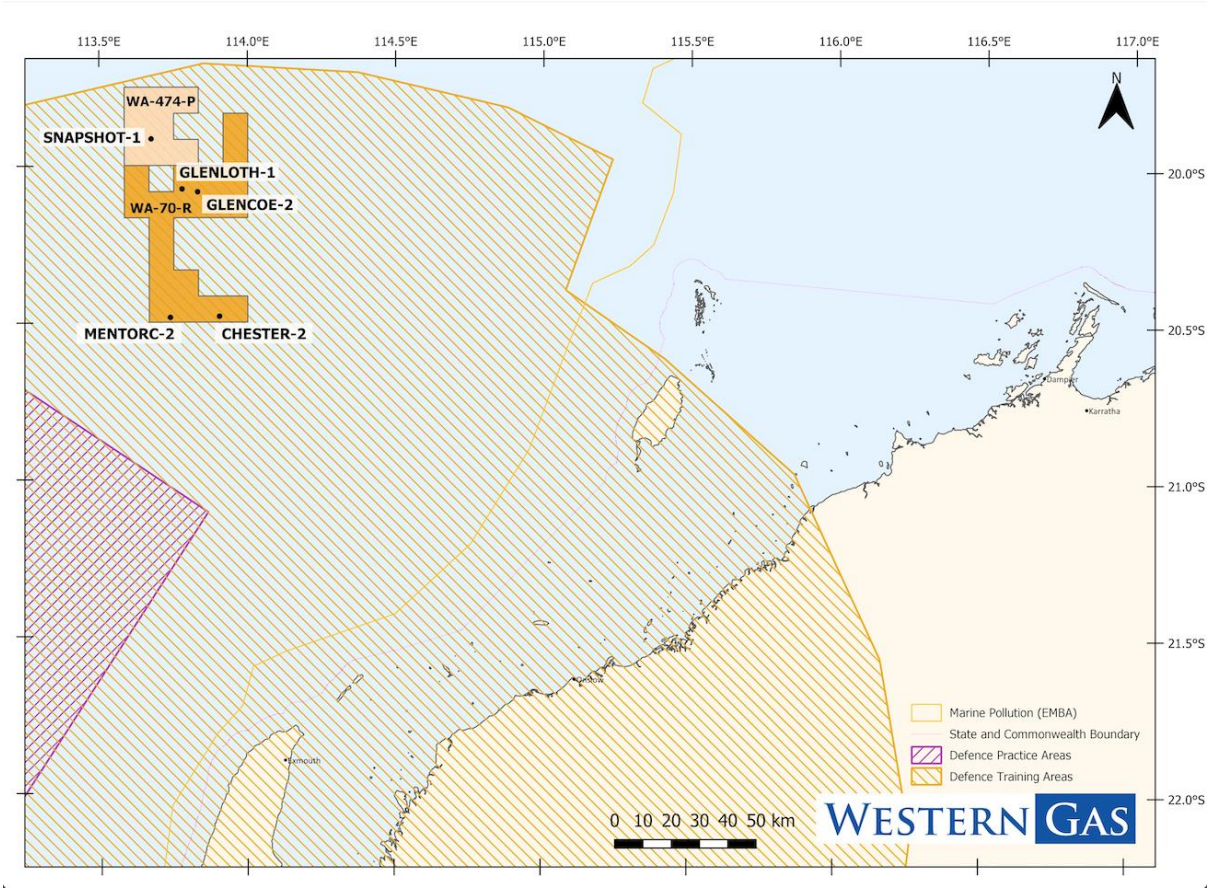
Your feedback will be included in the Environment Plan for the proposed activities, which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

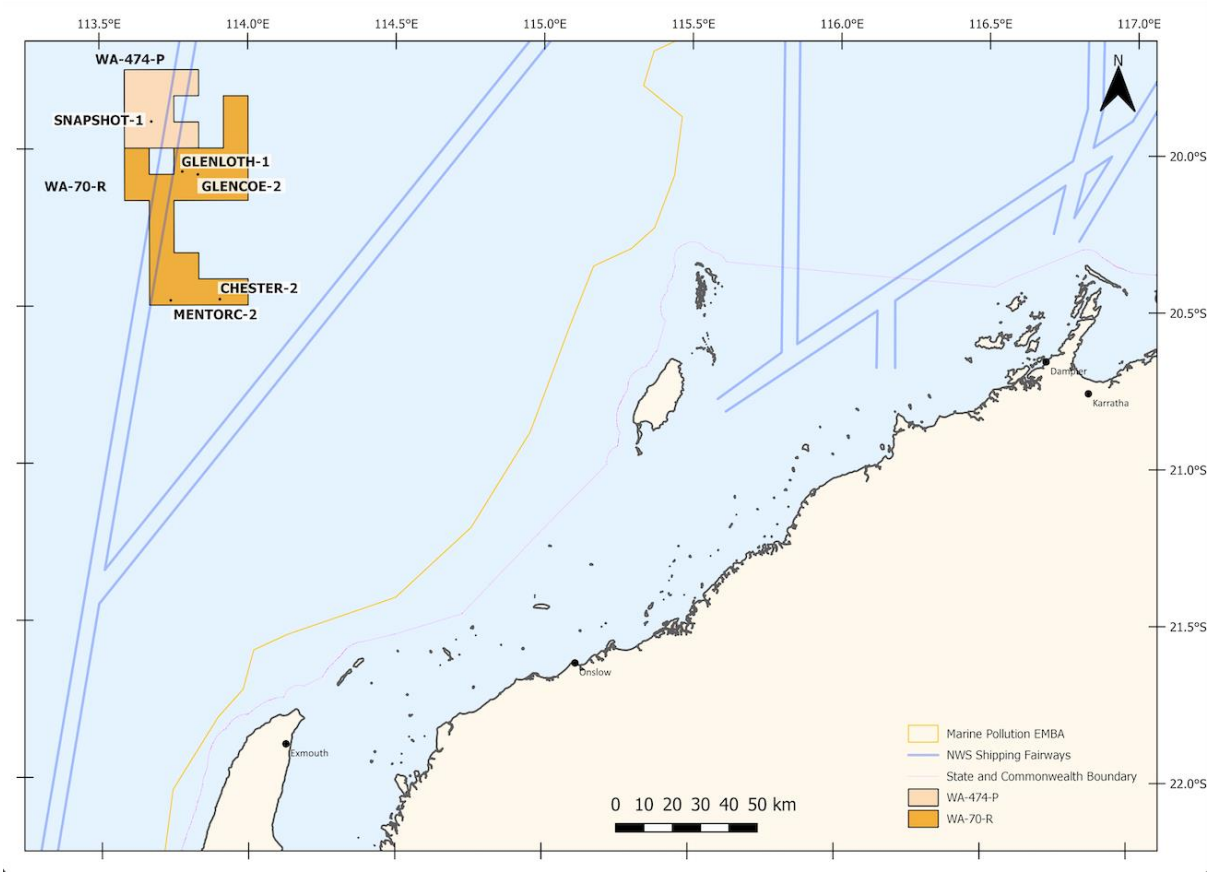
Please let us know if wish your personal/organisation details or any part of your feedback to remain confidential as a summary of your feedback and our response in the Environment Plan for this activity will be published on NOPSEMA's web site.

Please contact Western Gas at:
feedback@westerngas.com.au

WESTERN GAS **Accelerating development of Western Australia's gas resources**

Examples of maps provided to relevant persons – Defence and Shipping





Examples of Public Notice – The West Australian newspaper (7 November 2022)

PUBLIC NOTICE

WA-70-R and WA-474-P Activities

Western Gas is a Western Australian company with natural gas interests in the North West Shelf. We hold acreage including petroleum titles WA-70-R and WA-474-P, which contain four abandoned wells and one suspended well.

The wells are approximately 180 km northwest of Onslow and 150 km north of Exmouth, Western Australia. Western Gas plans to leave the four abandoned wellheads *in situ*, as well as conduct annual vessel-based wellhead surveys for the suspended well. The survey will involve a few days of vessel operations each year at the suspended well location.

As with all Petroleum Activities in Commonwealth Waters, impacts and potential risks associated with these activities will be assessed and managed through regulatory processes under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and Regulations, with an Environment Plan submitted to the National Offshore Petroleum Safety and Management Authority (NOPSEMA) for assessment.

Western Gas welcomes feedback from stakeholders whose functions, activities or interests may be impacted by these activities.

Please visit our web site at westerngas.com.au/consultation or contact us at feedback@westerngas.com.au for more information about proposed activities.

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