PTTEP Australasia

TECHNICAL DOCUMENT

Approval Status: **APPROVED**

Title:	**Montara Operations Environment Plan Summary**		
Revision No:	**1**	Technical ID:	**MV-HSE-D30-811715**
Belongs To:	**Montara Venture**	System:	
Technical Discipline	**HSE**		
Class:		Sub-Class:	
Function:	**Production Operations**	Process:	**D30 Common To Function**
Related Documents			
Hard Copy Location	**Volume 1 Book 1 of 6**		

Approver: Production Operations Manager	**Technical Authority: OIM**	**Commercial Authority: General Counsel**	**SSHE Review: Safety Manager**	**Originator: GLEN NICHOLSON**
Signature:	Signature:	Signature:	Signature:	Signature:
Date: 19/12/13	Date: 19/12/13	Date: 18-12-2013	Date: 18-12-13	Date: 18/12/13

Revision Number	Revision Date	Revision Remarks	Originator
1	18/12/2013	Updated to reflect current approved EP	GLEN NICHOLSON
0	29/12/2011	Environment Plan Summary	GLEN NICHOLSON

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

1 INTRODUCTION

PTTEP Australasia (Ashmore Cartier) Pty Ltd (PTTEP AA), as operator of production licences AC/L7 and AC/L8, has prepared this summary of the Montara Operations Environment Plan (EP) to comply with Regulation 11(7) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R).

An Environment Plan for this activity was accepted on 23 December 2011 by the delegate of the Designated Authority, the former Northern Territory Department of Resources (NTDoR), on behalf of the Commonwealth Government, with responsibility for acceptance of the Plan in accordance with the OPGGS(E)R.

NOPSEMA requested PTTEP AA to submit a revised Plan in accordance with Regulation 18(8) of the OPGGS(E)R and the revised Plan was accepted on 10 December 2013.

2 LOCATION OF ACTIVITY

The Montara Development Project (MDP) is located in Commonwealth waters within Production Licences AC/L7 and AC/L8 in the Timor Sea, between Australia and the island of Timor approximately 690 km (373 nm) east of Darwin in a water depth of approximately 77 m (LAT) (refer to Figure 1).

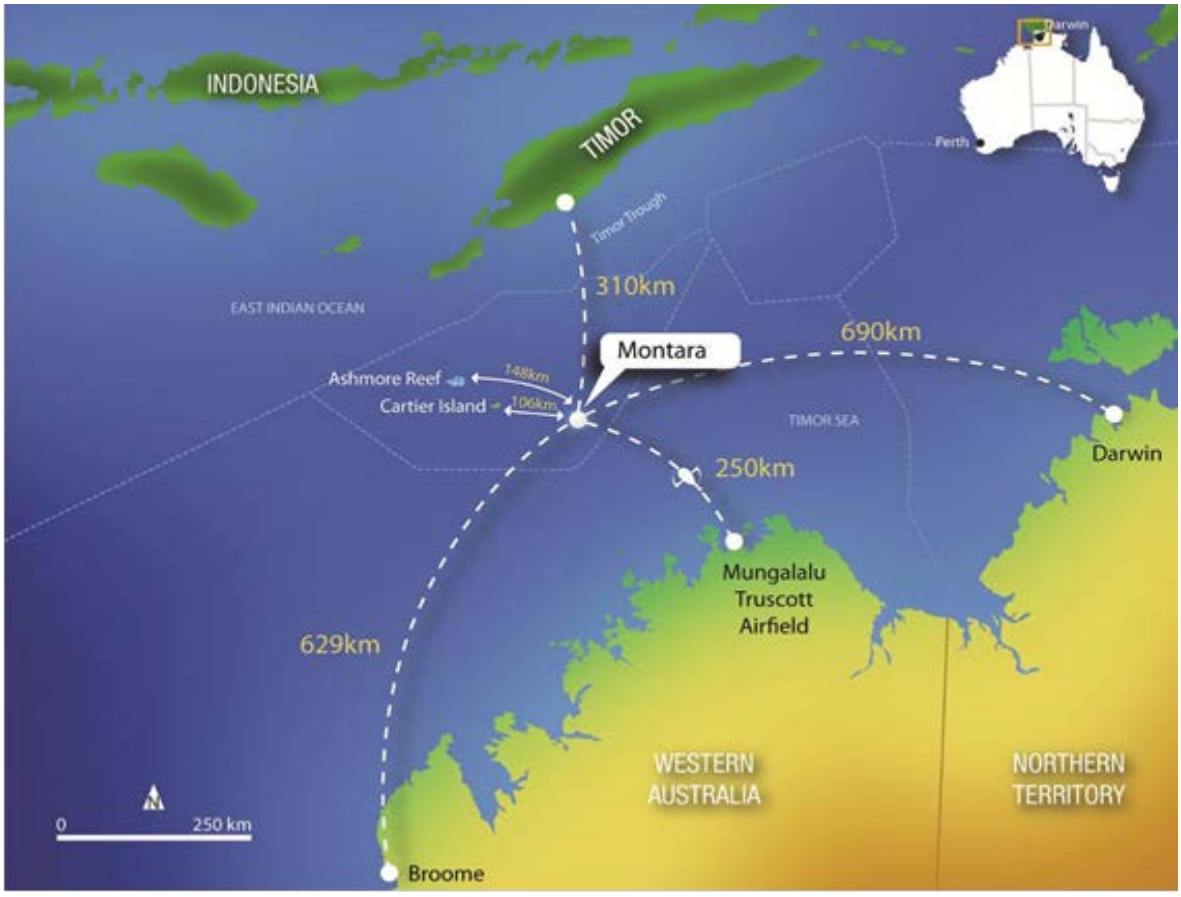

Figure 1 – Site Location of the Montara Field

3 DESCRIPTION OF ACTIVITY

The EP applies to all operational activities of the MDP within Licence Areas AC/L7 and AC/L8. The MDP comprises the production of hydrocarbons from the Montara, Skua, Swift and Swallow fields, using a Floating Production Storage and Offloading facility (FPSO), a Wellhead Platform (WHP) and associated flowlines and subsea equipment.

Montara production commenced in Quarter 2 2013 and is expected to have a project life of approximately 12 years.

The MDP consists of the following infrastructure, with the key location coordinates listed in Table 1 below:

- an unmanned WHP at the Montara field with five (5) wells, three (3) 14 inch Production Risers, two (2) 6 inch Gas Lift Risers and one (1) 12 inch J-Tube;
- five (5) subsea wells for development of the Skua, Swift and Swallow fields;
- production flowline system consisting of two (2) 6- inch, one (1) 10 inch and three (3) 14 inch flowlines and associated tie-in spools;
- gas lift flowline system consisting of one (1) 6 inch and three (3) 4 inch flowlines and associated tie-in spools;
- three (3) infield control umbilicals and associated flying leads;
- a subsea manifold in the Swift field for comingling the production fluids and distributing the compressed gas and electro-hydraulic services to the subsea wells; and
- a FPSO facility and its associated mooring system located approximately 1.5 km northeast of the WHP. Two (2) 10 inch Flexible Production Risers and associated riser bases. One (1) 6 inch Flexible Gas Lift Riser and associated riser base. Two (2) control umbilicals and associated rise bases. One (1) gas compressor for the gas lift system.

Table 1 – Montara Development Infrastructure Coordinates (Surface) (GDA 94, Zone 51)

Well and Infrastructure Locations	Latitude (South)	Longitude (East)
Montara Venture FPSO (Turret centre)	12° 39' 35.3”	124° 32' 41.1”
Wellhead Platform	12° 40' 20.5”	124° 32' 22.2”
Swallow 1 Subsea well	12° 32' 29.5”	124° 26' 36.8”
Swift North 1 Subsea well	12° 31' 29.9”	124° 27' 33.7”
Swift-2 Subsea well	12° 32' 3.6”	124° 27' 6.0”
Skua 10 Subsea well	12° 30' 4.6”	124° 25' 5.4”
Skua 11 Subsea well	12° 30' 4.6”	124° 25' 5.6”
Montara GI ST-1 (to be renamed H5) well	12° 40’ 20.466”	124° 32’ 22.320”
Montara H4 well	12° 40’ 20.547”	124° 32’ 22.321”
Montara H3 ST-1 well	12° 40’ 20.548”	124° 32’ 22.162”
Montara H2 well	12° 40’ 20.548”	124° 32’ 22.241”
Montara G2 well	12° 40’ 20.466”	124° 32’ 22.320”

A number of activities support the overall operation of the facility, these include:

- Utility systems such as lighting, heating, ventilation and air conditioning, seawater treatment for cooling water and potable water and power generation;
- Collection, treatment and disposal of sewage and putrescible wastes;
- Lifting operations;
- Transfer of supplies from vessels including food, equipment and fuel;
- Helicopter operations for transporting personnel and urgent freight; and
- Subsea inspection, maintenance and repair activities.

4 DESCRIPTION OF RECEIVING ENVIRONMENT

4.1 PHYSICAL AND BIOLOGICAL ENVIRONMENT

The MDP area is located on Australian continental shelf in the Timor Sea. In general, the continental shelf is a flat featureless submarine plain that dips gently northward toward the edge of the shelf, but scattered throughout the region are sea mounts, shoals and occasional islands that support a diverse flora and fauna. The Timor Trough, with water depths up to 9,000 m, marks the northern boundary of the continental shelf.

Regionally, the MDP area is located in the Timor Province Bioregion of the Northwest Shelf Transition Bioregion and within the larger Northwest Marine Region (NWMR) Planning Area. The variety of geomorphic features in the Timor Province results in several distinct habitats and biological communities, many of which are in close proximity to each other. The reefs and islands of the bioregion are regarded as particular hotspots for biodiversity and support a range of important pelagic and benthic ecological communities. A high level of endemism has been identified in demersal fish communities of the continental slope in the Timor Province, with two distinct communities identified (upper slope and mid slope).

The Timor Province Bioregion includes the marine protected areas of Ashmore Reef, Cartier Island, Hibernia Reef, Seringapatam Reef and Scott Reef. These reefs are recognised as having high richness and diversity of coral species with the nearest being Cartier Island which is approximately 106 km to the west of the MDP area.

The nearest shoals to the Montara Operations are Goeree and Vulcan Shoals (located 33 km and 34 km to the southwest respectively), Eugene McDermott Shoal (46 km to the south) and Barracouta Shoal (57 km northwest), known to support diverse biological communities across their shallow plateau areas.

The seabed local to the Montara field site slopes from the east (76.0 m) to west (86.5 m) and is characterised by a north-south trending gentle scarp.

The benthic environments of the NWMR are generally dominated by soft sediments, sand and mud, with occasional patches of coarser sediments (Woodside 2011). The extensive soft sediment habitat, in combination with little topographic relief, has very large expanses of monotonous benthos as there are limited different habitats or niches for animals to occupy.

In the MDP area, at approximately a 77 m depth, there is little evidence of epibenthic communities. It has been noted by Heyward *et al*. (1997) that where there is little seafloor topography, such as in the MDP area, there is minimal habitat diversity or niches for marine fauna to occupy. Species commonly found in these areas of soft sediment include sponges, gorgonians such as sea whips and sea fans, ascidians such as sea squirts, echinoderms, crustaceans, bryozoans such as lace corals, and soft corals. The absence of hard substrate is considered a limiting factor for recruitment of epibenthic organisms (Heyward et al 1997).

Protected Fauna

An EPBC Act Protected Matters Database search for endangered and vulnerable marine species was undertaken based on the location of the Montara WHP by PTTEP AA and identified nine

threatened species that may occur or have habitat in the Montara field. The nine listed threatened species are:

- Blue whale (Balaenoptera musculus);
- Humpback whale (Megaptera novaeangliae);
- Green turtle (Chelonia mydas);
- Loggerhead turtle (Caretta caretta);
- Leatherback turtle (Dermochelys coriacea);
- Hawksbill turtle (Eretmochelys imbricata);
- Olive ridley turtle (Lepidochelys olivacea);
- Flatback turtle (Natator depressus); and
- Whale shark (Rhincodon typus).

The search also identified 18 listed migratory species that may be encountered within the Montara field. The listed marine species are described below.

Fish

The EPBC Act Protected Matters search identified three fish species (listed Marine species) that may occur in or have habitat in the Montara field. None of these species are considered threatened or are migratory species. These species are ray-finned fishes and are either pipefish or seahorses (family Syngnathidae). These species will most likely be confined to the shallow waters of shoals and reefs.

Sharks

The EPBC Act Protected Matters search identified 31 migratory shark species that may occur in or have habitat in the Montara field.

Whale sharks (*Rhincodon typus*) are listed as Vulnerable and Migratory under the EPBC Act and Vulnerable under the World Conservation Union's 'Red List' of Threatened Species (IUCN 2012). They are generally found in areas where the surface temperature is 21–25 °C, preferably with cold water of 17 °C or less upwelling into it, and salinity of 34.0 to 34.5 parts per thousand (ppt) (Pogonoski *et al.* 2002). Whale sharks have a broad distribution in tropical and warm temperate seas. In Australian waters, they are known to aggregate at Ningaloo Reef approximately 1,500 km south-west of Montara WHP between May and June and in the Queensland Coral Sea approximately 2,400 km east of the Licence Area between November and December. The Whale shark is a highly migratory fish and only visits Australian waters seasonally (SEWPaC 2013). Whale sharks are not known to feed or breed in the MDP area; however, whale sharks may occur in the MDP area due to their widespread distribution and highly migratory nature, albeit in very low numbers.

The shortfin mako (*Isurus oxyrinchus*) and the longfin mako (*Isurus paucus*) are offshore epipelagic species found in tropical and warm-temperate waters. Both species occur in Australia in coastal waters off WA, NT, QLD and NSW at depths ranging from shallow coastal waters to at least 500 m. These species may migrate through the MDP area.

Cetaceans

The SEWPaC Protected Matters database did not identify known foraging, feeding, breeding or aggregation areas for cetaceans within 20 km of the MDP area. However, transient marine species have the potential to traverse the MDP area; therefore descriptions on the known distribution and occurrence of potential transient species within the MDP area are provided below.

Two species are listed as threatened under the EPBC Act and may occur in or around the MDP area.

- Blue Whale (endangered/migratory).
- Humpback Whale (vulnerable/migratory).

Blue Whale (Endangered/Migratory)

Blue whales (*Balaenoptera musculus*) are widely distributed throughout the worlds' oceans. There are two subspecies in the Southern Hemisphere: the southern blue whale (*Balaenoptera musculus intermedia*) and the pygmy blue whale (*Balaenoptera musculus brevicauda)* (DEWHA 2008). In general, the southern blue whale is found south of 60° S and pygmy blue whales are found north of 55° S (DEWHA 2008), making it highly likely that any blue whales frequenting the waters surrounding MDP area would be pygmy blue whales.

Blue whale migration is thought to follow deep oceanic routes, although little is known about their precise migration routes (SEWPaC 2013). Sea noise loggers set at various locations along the coast of Western Australia have detected a seasonal presence indicating a pattern of annual northbound and southbound migration of pygmy blue whales past Exmouth and the Montebello Islands and locations to the north (McCauley and Jenner 2010). Pygmy Blue whales appear to migrate south from Indonesian waters passing Exmouth through November to late December each year. Observations suggest most Pygmy Blue whales pass along the shelf edge out to water depths of 1,000m but centred near the 500 m depth contour. The northern migration passes Exmouth over an extended period ranging from April to August (McCauley and Jenner 2010).

The Perth Canyon is the only area so far identified off the Western Australia coast where pygmy blue whales aggregate with some predictability. The area represents a significant feeding ground for pygmy blue whales between January and April (McCauley and Jenner 2010). Blue whales are believed to calve in tropical waters in winter and births peak in May to June, however, the exact breeding grounds of this species are unknown (Bannister *et al.* 1996).

The MDP area does not include any recognised blue whale migratory routes or known feeding, breeding or resting areas. However, insignificant numbers of blue whales migrating south from Indonesian waters may occasionally pass through the operations.

Humpback Whale (Vulnerable/Migratory)

Humpback whales (*Megaptera novaeangliae*) also have a wide distribution and have been recorded from the coastal areas off all Australian states except the Northern Territory (Bannister *et al.* 1996). Humpback whales migrate north and south along the eastern and western coasts of Australia from calving grounds in the tropical north to feeding grounds in the Southern Ocean (SEWPaC 2013). Peak migration off the north-western coast of Australia occurs from late July to early September. From June to mid-September the inshore waters (landward of the 100 m isobath) between the Lacepede Islands and Camden Sound (400 km south-west of the MDP area) are used as a calving area for this species (Jenner *et al.* 2001).

EPBC Act Protected Matters search indicates that the Montara WHP and a 20 km buffer is located outside of the recognised Humpback whale migratory routes which are usually within 30 kilometres of the coastline.

Other Migratory Cetaceans

In addition to the humpback whale and blue whale, five other migratory cetacean species have the potential to occur within the MDP area:

- Antarctic minke whale;
- Bryde's whale;
- Killer whale;
- Sperm whale; and
- Spotted dolphin.

Surveys conducted in response to the Montara incident recorded a total of 462 individual cetaceans. Four different species were positively identified: false killer whale, common bottlenose dolphin, pantropical spotted dolphin and long-snouted spinner dolphin (Watson *et al.* 2009). Twenty-four individuals could not be identified.

Due to the open oceanic conditions of MDP area, there are no features such as feeding or breeding grounds that will cause cetaceans to concentrate. The MDP area is not located near any known migration route (Jenner *et al.* 2001). There is potential for cetaceans to travel through the area however, most of these species tend to move individually or in small pods and do not aggregate.

Dugongs

Dugongs (*Dugong dugon*) are protected under the *Wildlife Conservation Act 1950 WA* and are listed as migratory and protected species under the EPBC Act. Dugongs feed exclusively on seagrass and are found in shallow, protected waters in tropical and sub-tropical regions. The distribution of dugongs in Australia ranges from Shark Bay in WA extending around the Northern Territory coastline to Moreton Bay in Queensland (Marsh and Lefebvre 1994). A recent survey of Vulcan Shoal observed an extensive area of seagrass (Heyward *et al.* 2010) and, while not observed, it is possible that dugongs frequent the shoal.

Dugongs are known to frequent Ashmore Reef, with estimates of between 10 to 60 individuals (Whiting and Guinea 2005), and are likely to extend to Cartier Island as critical seagrass habitat is available (Commonwealth of Australia 2002). A dugong has also been recorded 130 km east of Ashmore Reef, indicating that dugongs may also use other shallow shoals on the Sahul Banks (Whiting and Guinea 2005).

Although there is limited information on the presence of dugongs in deeper offshore waters, the absence of food suggests that this is unlikely.

Turtles

The EPBC search recorded six species of marine turtle that may occur in the Montara field (loggerhead, green, leatherback, hawksbill, olive ridley and flatback turtle). Marine turtles undertake extensive migrations and low numbers of individuals may transit through the MDP area and are most likely to occur near the shallower seamount habitats, which may provide occasional feeding habitat.

While sea turtles are expected to pass through the Montara field during their migration, the open oceanic conditions of the Montara field means there are no features, such as emergent land, shallow sub-tidal features or other habitats, to support feeding or breeding grounds that will result in concentrations of these species directly adjacent to the MDP area. Ashmore Reef, Cartier Island and Hibernia Reef, all more than 100 km from the Montara WHP, are important feeding grounds and/or nesting sites for Green, Loggerhead and Hawksbill Turtles.

Sea Snakes

All sea snakes in Australia are listed as protected species under the EPBC Act. The Kimberley region is noted as supporting some of the highest abundance of sea snakes anywhere off the Australian coast (Guinea and Whiting 2005).

Twenty species of sea snakes occur in the NWMR, and three are species endemic to the North West Shelf area (SEWPaC 2013). Sea snakes are air-breathing reptiles which feed in shallow, benthic areas and are typically found in shallow inshore regions and islands however, they also occur at nearby islands and further offshore at atolls such as Scott Reef, Ashmore Reef, Cartier Island and Hibernia Reef (Guinea 2006). Only a few species of sea snake are known to inhabit deep pelagic environments, with observations indicating that most sea snakes are rarely found in depths exceeding 30 m (Cogger 1975).

A search of the EPBC Act Protected Matters database identified 13 species of sea snake that may occur in, or have habitat in, the MDP area. Surveys conducted in response to the Montara incident recorded a total of 62 individual sea snakes in open water. Four species were confidently identified: olive sea snake, horned sea snake, spotted sea snake and the olive-headed sea snake (Watson et al. 2009). The most commonly encountered species was the spotted sea snake.

Marine Birds

Numerous species of birds frequent the Timor Sea area or over fly it on annual migrations. Seabird feeding grounds, roosting and nesting areas are found on the offshore atolls, particularly Ashmore Reef. Many species are listed under the Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) or Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA). Most seabirds breed at offshore sites, such as Ashmore Reef, Cartier Island and Browse Island, between mid-April to mid-May (Clarke 2010). Peak migration time of migratory shorebirds is between October to December (Clarke 2010).

It is expected that some individuals of these species would pass through the MDP area during their annual migrations and may form temporary feeding aggregations, subject to the availability of food.

One migratory seabird, the streaked shearwater (*Calonectris leucomelas*), may occur in the MDP area, as identified in the EPBC search. The streaked shearwater is also protected under the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA). While the species does not breed in Australia, it is recorded regularly over pelagic and inshore waters in northern Australia from October to March, with some records as early as August and as late as May. The streaked shearwater has been recorded off the Northern Territory coast and is noted as being common in the Arafura Sea during summer. The species forages (mainly fish and squid) in the North Marine Region and nest on nearby islands and coastlines. Given the lack of suitable habitat areas within the MDP area it is unlikely streaked shearwaters will be encountered in significant numbers during the activity.

4.2 SOCIAL ENVIRONMENT

Fisheries

The North Coast bioregion of Western Australia (Pilbara/Kimberley) supports a number of commercial fisheries (Department of Agriculture, Fisheries and Forestry (DAFF 2013). The MDP area overlaps or occurs in the vicinity of five commercial, Commonwealth managed fisheries: Northwest Slope Trawl Fishery, Western Tuna and Billfish Fishery, Western Skipjack Tuna Fishery, Southern Bluefin Tuna Fishery and Northern Prawn Fishery, and three State managed fisheries: Northern Demersal Scalefish Fishery, Northern Shark Fishery and Kimberley Prawn Managed Fishery.

Northwest Slope Trawl Fishery

Fishing effort is restricted in the North West Slope Trawl Fishery by a limit on the number of vessel permits. As of June 2010, there were seven permits in the fishery (DAFF 2013). The main fishing area is more than 400 km south-east of the Montara WHP in the waters surrounding the Rowley Shoals and Mermaid Reef. Due to the low number of active vessels, low levels of fishing activity are anticipated within the MDP area and surrounds.

Western Tuna and Billfish Fishery

Recently published data from DAFF (2013) indicates that this long-line fishery has been in decline since 2001 with only four active vessels in 2009. While the WTBF management area encompasses the MDP, fisheries data indicates that fishing operations are concentrated south west of the North West Cape. As a result, no active fishing from the Western Tuna and Billfish Fishery is anticipated within the MDP area and surrounds.

Western Skipjack Tuna Fishery

While fishing season in the NWMR for the Western Skipjack Fishery is between November to June, no active fishing was undertaken by Australian vessels in 2009-10 (DAFF 2013). As a result, no active fishing from the Western Skipjack Tuna Fishery is anticipated within the MDP area and surrounds.

Southern Bluefin Tuna Fishery

Although the MDP area is located within the limits of the Southern Bluefin Tuna Fishery, it is outside of key catch areas, which included waters off South Australia, New South Wales and Queensland in 2012. As a result, no active fishing from the Southern Bluefin Tuna Fishery is anticipated within the MDP area and surrounds.

Northern Prawn Fishery

The majority of the fishing effort within the Northern Prawn Fishery occurs in the area of the Gulf of Carpentaria, with the remainder occurring off Arnhem Land and in the Joseph Bonaparte Gulf. As a result, no active fishing from the Northern Prawn Fishery is anticipated within the MDP area and surrounds.

Northern Demersal Scalefish Fishery

The Northern Demersal Scalefish Fishery has a total of 11 licences issued for the fishery and it is actively fished by five vessels based out of Broome, Pilbara and Darwin. Fish traps and lines are used to principally target high-value scalefish species such as red emperor, gold-band snapper and cod. The MDP area operations are not expected to impact upon this fishery. As a result of the Montara incident a 500 m safety exclusion zone exists around the Montara WHP, therefore no active fishing from the Northern Demersal Scalefish Fishery can occur within the immediate surrounds of the Montara WHP.

Northern Shark Fishery

The Northern Shark Fishery has seven licences issued for the fishery and only three to four vessels are working in the entire fishery, based on AFMA returns. There is little or no shark fishing in the immediate area of the proposed activities. A 500 m safety exclusion zone exists around the Montara WHP; therefore no active fishing from the Northern Shark Fishery can occur within the immediate surrounds of the Montara WHP.

Kimberley Prawn Managed Fishery

The Kimberley Prawn Managed Fishery operates off the north of the state between Koolan Island and Cape Londonderry. In 2010, the areas trawled were all within 100 km of the Australian mainland coastline. As a result, no active fishing is anticipated within the MDP area and surrounds. The MDP area is near the Australian Indonesian MoU Box and thus may co-incide with some traditional Indonesian fishing activities (allowed under the 1974 MOU with Indonesia).

Oil Industry

There are a number of oil and gas companies holding petroleum permits in the vicinity of the MDP area. The closest current activity is the Puffin gas field (Exploration Permit Area AC/22 and Production Licence AC/L6) which is operated by Sinopec in Joint Venture with AED Oil. Other proponents in the Timor Sea are at various stages of appraisal, planning and approval in advance of Final Investment Decision.

Shipping

The majority of the major commercial shipping through the Timor Sea passes well to the north of the MDP area. The majority of vessels utilising this route are bauxite carriers servicing terminals at Gove in the Northern Territory and Weipa on the Cape York Peninsula, and coal carriers and container vessels departing Queensland ports for destinations in the Middle East, Europe and South Africa (LeProvost Dames and Moore 1997).

Areas of Conservation Significance

Ashmore Reef

Ashmore Reef, approximately 168 km to the northwest of the Montara WHP, is protected by the Commonwealth managed Ashmore Reef National Nature Reserve and is also a designated

RAMSAR wetland of international significance (Clarke 2010). Ashmore Reef is a large platform reef characterised by an atoll-like structure with three low, vegetated (shrubs and herbs) islands, numerous shifting sand banks and two large lagoon areas. The surrounding reef consists of a well developed reef crest most prominent on the south and east sides and a broad reef flat. The edge of the reef flat has large areas of sand which become exposed at low tide. The islands located within the lagoon are mostly flat, being composed of coarse sand with a few areas of exposed beachrock and limestone outcrops. Ashmore Reef is internationally recognised as a significant breeding area for green turtles and for its abundance and diversity of sea snakes (Guinea 2007). Ashmore Reef also has a high coverage of seagrass which supports a small dugong population.

Cartier Island

Cartier Island, approximately 106 km northwest of the Montara WHP, and surrounding reefs are protected by the Cartier Island Marine Reserve. Cartier Island is characterised by an un-vegetated sand cay which is stabilised by patches of beach rock and surrounding mature reef flats. The effects of wind, tides and rain periodically expose and remove areas of shifting sandbank. The island supports a large population of nesting marine turtles.

Hibernia Reef

Hibernia Reef is part of the same group as Ashmore Reef and Cartier Island and does not form part of the Ashmore Reef and Cartier Island External Territory of Australia. Hibernia Reef is located 42 km northeast from Ashmore Reef and 62 km northwest of Cartier Island and is an oval-shaped reef that tapers to a point on the western side. While the reef has no permanent land, large areas can become exposed at low tide. Hibernia Reef is also characterised by a deep central lagoon and drying sand flats.

Scott Reef

Scott Reef (North Scott Reef and South Scott Reef) and Surrounds is listed as a Commonwealth Heritage Place and is also listed on the Register of National Estate.

North Scott Reef is an annular reef enclosing a deep lagoon that is connected to the ocean by passages in the northeast and southwest. South Scott Reef is a crescent shaped reef which subtends North Scott Reef and partially encloses another deep lagoon. South and North and Scott Reef are separated by a deep (400 m to 700 m) channel.

Corals communities at Scott Reef occur across shallow (<30 m) and deep (>30 m) habitats, with 306 species from 60 genera and 14 families having been identified (Gilmour *et al.* 2009).

Shallow water environments supported a higher diversity of corals (295 species) than deeper waters (51 species). Of the corals recorded, none were endemic to Scott Reef (Gilmour *et al.* 2009) and all predominantly widespread Indo–Pacific species. Coral species diversity at Scott Reef has been found to be comparable to other reefs in the region, such as Ashmore, Seringapatam and Mermaid Reef also known as Rowley Shoals, with clear affinities to coral assemblages at Ashmore Reef and the Indonesian provinces.

Seringapatam Reef

Seringapatam Reef and surrounds is listed as a Commonwealth Heritage Place and is also listed on the Register of National Estate. Seringapatam Reef covers an area of approximately 55 km² and encloses a lagoon of relatively consistent depth of 20 m with a maximum depth of 30 m. The lagoon is connected to the ocean by a narrow passage in the northeast part of the reef (SEWPaC 2012).

The reef is a regionally important scleractinian coral reef as it has a high biodiversity. A 2010 survey by Heyward *et al.* (2010) on the condition of shallow reef communities at Seringapatam Reef (in response to the Montara oil spill) noted that the coral cover on slopes (20-25%) and reef flats (<10%) to be similar to Ashmore Reef and Cartier Island surveyed in the same study. Mean coral abundance at 6 m depth sites across the whole reef however was significantly higher at Seringapatam than at either Ashmore Reef or Cartier Island.

Browse Island

Browse Island, approximately 191 km southwest of the Montara WHP, and the waters surrounding it for a distance of three nautical miles are in WA State Territorial Waters and is a Nature Reserve. The island is a sand (up to 10 m above sea level) and limestone cay situated on a limestone and coral reef. Browse Island is vegetated with herbs and low shrubs (Clarke 2010). The island represents an important marine turtle nesting site in the region for the Green turtle (*Chelonia mydas*). No seagrass communities have been observed surrounding Browse Island.

5 ENVIRONMENTAL RISK ASSESSMENT

An environmental hazard identification and risk assessment was undertaken using methods consistent with AS/NZS ISO 31000:2009 (AS/NZS 2009) and the PTTEP AA SSHE Risk Management Standard (SSHE-106-STD-400, Rev 3).

The key environmental hazards and control measures for the activity are presented in Appendix A. All control measures detailed in the EP will be implemented to ensure risk is managed to ALARP and will be of an acceptable level.

6 MANAGEMENT APPROACH

PTTEP AA is committed to proactive management of its environmental responsibilities in all its activities. The elements of the management approach include the specific systems, procedures and practices which are used to ensure that the environmental impacts and risks of the activity are reduced to ALARP and that the environmental performance objectives are met. The implementation strategy includes roles and responsibilities of personnel, training and awareness of personnel, a reporting framework, mitigation and emergency response arrangements, and compliance monitoring and auditing procedures.

PTTEP AA, as the operator of the activity, is responsible for ensuring the activity is managed in accordance with the accepted Environment Plan.

Environmental performance objectives, standards and criteria have been defined in the accepted EP and are monitored and reviewed to ensure effective implementation of the environmental requirements and continual improvement in achieving environmental outcomes.

All incidents that have the potential to cause significant effects on the environment will be reported and investigated according to legislative requirements and the procedures laid out in the EP.

NOPSEMA will be notified of all reportable incidents within two hours of the incident first occurring (or the operator becomes aware of the incident), according to the requirements of Regulation 26 of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.*

A written report will be provided to NOPSEMA within three days of the initial notification of a reportable incident. Reportable incidents for the activity are:

- An uncontrolled release of hydrocarbons or hazardous chemicals >80L to the environment;
- An uncontrolled gaseous release to atmosphere of >300kg; and
- Disturbance to a particular sensitivity associated with an activity e.g. injury or death of a species of conservation value or damage to habitat of importance to those species.

7 STAKEHOLDER CONSULTATION

The following relevant stakeholders have been consulted via email and letter in regards to the activity during preparation of the EP with details on the location, timing and activity provided along with a request for any feedback on potential issues or concerns:

Commonwealth Government

Australian Fisheries Management Authority (AFMA); Australian Hydrographic Service, Department of Defence; Australian Maritime Safety Authority (AMSA); Border Protection Command;

Department of Agriculture, Fisheries and Forestry (DAFF); Department of Resources, Energy and Tourism (DRET) now Department of Industry (DoI); Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) now Department of Environment (DoE); Department of Foreign Affairs and Trade (DFAT).

State/Territory Government

Department of Environment and Conservation, WA (DEC); Department of Fisheries, WA; Department of Transport, WA; Environmental Protection Authority, WA (EPA); Department of Mines and Petroleum (WA); NT Department of Resources, Minerals and Energy Division; NT Department of Primary Industry and Fisheries, Fisheries Division.

Responsible State/Territory Minister

NT Office of the Chief Minister

Organisation whose functions, interests or activities may be affected

Commonwealth Fisheries Association (CFA); NT Seafood Council; Northern Prawn Fishery; Northern Prawn Fishery (QLD) Trawl Association; Pearl Producers Association; WA Fishing Industry Council; Western Australian Northern Trawl Owners Association; commercial fishing operators within relevant identified fisheries; adjacent Oil & Gas operators.

Organisations also considered relevant

Darwin Port Authority; Oil Spill Response Limited; Australian Marine Oil Spill Centre (AMOSC); Recfishwest; WA Conservation Council; World Wildlife Fund.

Indigenous stakeholders are not likely to be affected by the proposed action due to the distance offshore and absence of any Indigenous sites of significance Therefore, consultation has not, and is unlikely to, be undertaken with indigenous stakeholders.

PTTEP AA will continue to consult with above listed organisations in response to any issues that may be raised. Consultation with all of the stakeholders listed above, plus additional others identified during the consultation process, will continue during the activity if necessary.

8 CONTACT DETAILS

Further details on the activity can be obtained from:

Contact:	Glen Nicholson
Position:	Senior Environmental Advisor
Organisation:	PTTEP Australasia (Ashmore Cartier) Pty Ltd
Postal Address:	PO Box 7311, Cloisters Square, Perth WA 6850
Phone:	(08) 9483 9483
Email:	glen.nicholson@au.pttep.com

9 REFERENCES

Bannister, J.L., Kemper, C.M. and Warneke, R.M. (1996). *The Action Plan for Australian Cetaceans*, Australian Nature Conservation Agency, Perth, Australia.

Clarke, R.H. (2010). The Status of Seabirds and Shorebirds at Ashmore Reef and Cartier and Browse Islands: Monitoring Program for the Montara Well Release – Pre-Impact Assessment and First Post-Impact Field Survey. Prepared on behalf of PTTEP Australasia and the Department of the Environment, Water, Heritage and the Arts, Australia.

Cogger, H.G. (1975). *Sea Snakes of Australia and New Guinea*. In: Dunson, W.A., ed. The Biology of Sea Snakes. University Park Press, Baltimore.

Commonwealth of Australia (2002). *Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve (Commonwealth Waters) Management Plans*. Environment Australia, Canberra.

Cooper T.F., Dandan S.S., Heyward A., Kühl M., McKinney D.W., Moore C., O'Leary R., Ulstrup K.E., Underwood J.N., van Oppen M.J.H., Ziersen B. (2010a). Characterising the Genetic Connectivity and Photobiology of Deep Water Reef Building Corals at South Scott Reef, Western Australia. Report produced for Woodside Energy Ltd. Australian Institute of Marine Science, Perth, Australia. 50 pp.

DAFF (2013) http://www.afma.gov.au/managing-our-fisheries/fisheries-a-to-z-index accessed 05/04/2013.

Department of Sustainability, Environment, Water, Population and Communities (2013). Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed Wed, 3 Apr 2013

Department of Sustainability, Environment, Water, Populations and Community (SEWPaC) (2012). Marine bioregional plan for the North west Marine Region. hwww.environment.gov.au%2Fcoasts%2Fmarineplans%2Fnorthwest%2Fpubs%2Fnorth-wes-marineplan.pdf&ei=iYdbUZTYOKyeiAeP54DYAw&usg=AFQjCNF27FyP1HLq18UlP051QfQAFzVr1A Accessed Wed 3 Apr 2013

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). *The North-West Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems*, *Conservation Values and Uses of the South-West Marine Region*. [Online]. Department of the Environment, Water, Heritage and the Arts, Canberra, Australian Capital Territory. Available from: http://www.environment.gov.au/coasts/mbp/north-west/index.html

Gilmour JP, Travers MJ, Underwood JN, McKinney DW, Meekan MG, Gates EN, Fitzgerald KL 2009. Long-term Monitoring of Shallow-water Coral and Fish Communities at Scott Reef. AIMS SRRP Annual Report September 2009, Project 1. Report produced for Woodside Energy Ltd. Australian Institute of Marine Science, Townsville, Australia. 224pp.

Guinea, M.L. 1993. Reptilia, Aves and Mammalia. In: in Russell, B.C. & J.R. Hanley, eds. Survey of Marine Biological and Heritage Resources of Cartier and Hibernia Reefs, Timor Sea. Page(s) 74 - 83. Darwin: Northern Territory Museum of Arts and Sciences.

Guinea M.L, 2006. *Sea turtles, Sea Snakes and Dugongs of Scott Reef, Seringapatam Reef and Browse Island with notes on West Lacepede Island*. Report to URS. Charles Darwin University, Australia.

Guinea, M. 2007. *Marine Snakes: Species Profile for the North-west Planning Area*. Report for the National Oceans Office, Hobart.

Heyward, A., Pinceratto, E. and Smith, L.(eds.) 1997. *Big Bank Shoals of the Timor Sea: An Environmental Resource Atlas*. Prepared by Australian Institute of Marine Science and BHP Billiton Pty Ltd., Perth, Western Australia.

Heyward, A., Moore, C., Radford, B. and Colquhoun, J. 2010. Monitoring Program for the Montara Well Release Timor Sea: Final Report on the Nature of Barracouta and Vulcan Shoals. Report prepared by the Australian Institute of Marine Science for PTTEP AA, Perth, Western Australia.

INPEX 2010. Ichthys Gas Field Development Project: Draft Environmental Impact Statement. Available at: http://www.inpex.com.au/media/20857/ichthys_eis_complete.pdf.

IUCN—see International Union for Conservation of Nature and Natural Resources IUCN (2012). IUCN Red List of Threatened Species. Version 2012.2. Available at: www.iucnredlist.org (accessed 14/12/12).

Jenner, K.C.S., M.N.Jenner & K.A.McCabe (2001). Geographical and temporal movements of humpback whales in Western Australian waters. APPEA journal. Page(s) 749-765.

Le Provost, Dames and Moore 1997. Bayu-Undan Field Development Preliminary Environmental Report. Prepared for Phillips Petroleum Company and BHP Petroleum.

Marsh, H. and L.W. Lefebvre 1994. Sirenian Status and Conservation efforts. *Aquatic Mammals*. 20:767-788.

McCauley, R.D. and Jenner, C. (2010). Migratory patterns and estimated population size of pygmy blue whales (Balaenoptera musculus brevicauda) traversing the Western Australian coast based on passive acoustics. Report for the International Whaling Commission, SC/62/SH26. 9pp.

Pogonoski, J.J., Pollard, D.A. and Paxton, J.R., 2002, Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes, Environment Australia, Canberra.

Watson, J.E.M., Joseph, L.N. and Watson, A.W.T. (2009). A Rapid Assessment of the Impacts of the Montara Field Oil Leak on Birds, Cetaceans and Marine Reptiles. Prepared on behalf of the Department of the Environment, Water, Heritage and the Arts by the Spatial Ecology Laboratory, University of Queensland, Brisbane.

Whiting S.D. and Guinea M.L. (2005). *Dugongs of Ashmore Reef and the Sahul banks: A review of Current Knowledge and a Distribution of Sightings*. The Beagle - Records of the Museums and Art Galleries of the Northern Territory. Supplement 1, pp. 207-210.

Woodside Energy Ltd (2011). Browse LNG Development, Draft Upstream Environmental Impact Statement, EPBC Referral 2008/4111, November 2011.

APPENDIX A: ENVIRONMENTAL RISK ASSESSMENT SUMMARY

Hazard	Potential Impacts	Management Measures	Residual Risk
Uncontrolled subsurface release of hydrocarbon. Wellhead and SCSSV Failure – Max ~84,000m3 over 77 days Flowline Failure or Rupture - Maximum volume 1,400 m^3	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality, toxicological effects and oiling of islands and emergent coral reefs.	PTTEP AA Montara Subsea Integrity Management Plan (MV-MN-D33-812441) which includes inspection, monitoring and maintenance of subsea equipment. PTTEP AA Corrosion Management Strategy (MV-MN-D33-812291) which includes monitoring of subsea corrosion to ensure the technical integrity of subsea infrastructure and pipelines. PTTEP AA Containment – Subsea Wells and Infrastructure (MV-HSE-D30-811916) which includes inspections to ensure subsea infrastructure to be fit for service and degradation or damage is within design limits. PTTEP AA Offtake Operations – Facility Information Requirements (MV-OP-D32-808302) which manages all offtake tanker movements and operations. Establishment of a 500m zone around facilities to ensure restricted and controlled vessel access to within close proximity of facilities in accordance with Maritime Transport and Offshore Facilities Security Regulations 2003 Division 6.5 (Offshore Waterside Restricted Zone) and OPGGSA Section 6.6 (Petroleum Safety Zone) Compliance with PTTEP AA Blow Out Contingency Plan (IC-DR-D41-810550) including Memorandum of Understanding between PTTEP AA & other operators in the vicinity of the MDP area for assistance including rig for a relief well. Response undertaken in accordance with the accepted Montara Operations OSCP.	Medium
Small subsea hydrocarbon spill/leak from subsea infrastructure. Equipment malfunction, corrosion.	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality and toxicological effects.	PTTEP AA Montara Subsea Integrity Management Plan (MV-MN-D33-812441) which includes inspection, monitoring and maintenance of subsea equipment. PTTEP AA Corrosion Management Strategy (MV-MN-D33-812291) which includes monitoring of subsea corrosion to ensure the technical integrity of subsea infrastructure and pipelines. Response undertaken in accordance with the accepted Montara Operations OSCP.	Low

Hazard	Potential Impacts	Management Measures	Residual Risk
Large surface release of diesel Maximum volume 80m^3 Vessel Collision - Spill from ruptured fuel tank	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality, toxicological effects and oiling of islands and emergent coral reefs.	All supply vessel movements will be in accordance with the Supply Vessel Operations Procedure (D32-500798-FACCOM) which details facility approach communications protocols. Establishment of a 500m zone around facilities to ensure restricted and controlled vessel access to within close proximity of facilities in accordance with Maritime Transport and Offshore Facilities Security Regulations 2003 Division 6.5 (Offshore Waterside Restricted Zone) and OPGGSA Section 6.6 (Petroleum Safety Zone). Vessel crew competency will meet the Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95). PTTEP AA Offtake Operations – Facility Information Requirements (MV-OP-D32-808302) which manages all offtake tanker movements and operations. Standard maritime safety procedures for supply vessels in accordance with Marine Orders Part 30 including 24hr watch, radio contact and display of navigational lights and beacons MARPOL 73/78 Annex 1 Regulation 37 - Vessel specific Shipboard Oil Pollution Emergency Plan (SOPEP) for supply vessels with procedures to minimise loss to the marine environment.	Medium
Small surface release of diesel - Maximum volume 10m^3 from a bunkering spill.	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality, toxicological effects and oiling of islands and emergent coral reefs.	FPSO/ supply vessel specific bunkering procedures. MARPOL 73/78 Annex 1 Regulation 37 - Vessel specific Shipboard Oil Pollution Emergency Plan (SOPEP) for supply vessels with procedures to minimise loss to the marine environment.	Medium
Uncontrolled surface release of hydrocarbon during well intervention activities. Wellhead and SCSSV	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality, toxicological effects and oiling of	Well Integrity Assurance Management System (M12-505326-CORP) and the associated Well Operations Management Plan (MV-DR-D41-812626), which will be implemented to ensure the appropriate design and barriers during well intervention activities. Compliance with PTTEP AA Montara Structural Integrity Management Manual - WHP and FPSO Topsides (MV-MN-D33-812058) will be implemented to ensure inspection,	Medium

Hazard	Potential Impacts	Management Measures	Residual Risk
Failure – Max ~84,000m^3 over 77 days	islands and emergent coral reefs.	monitoring and maintenance of WHP and FPSO equipment. PTTEP AA Corrosion Management Strategy (MV-MN-D33-812291) which includes monitoring of corrosion to ensure the technical integrity of wellhead platform infrastructure and pipelines. PTTEP AA Containment – Surface Wells and Infrastructure Procedure (MV-HSE-D30-811942) which includes inspections to ensure wellheads and associated WHP infrastructure is fit for service and degradation or damage is within design limits. Compliance with PTTEP AA Blow Out Contingency Plan (IC-DR-D41-810550) including Memorandum of Understanding between PTTEP AA & other operators in the vicinity of the MDP area for assistance including rig for a relief well. Response undertaken in accordance with the accepted Montara Operations OSCP.	
Large surface release of hydrocarbon due to vessel collision. Crude - Maximum volume - 500m^3	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality, toxicological effects and oiling of islands and emergent coral reefs.	All supply vessel movements will be in accordance with the Supply Vessel Operations Procedure (D32-500798-FACCOM). Establishment of a 500m zone around facilities to ensure restricted and controlled vessel access to within close proximity of facilities in accordance with Maritime Transport and Offshore Facilities Security Regulations 2003 Division 6.5 (Offshore Waterside Restricted Zone) and OPGGSA Section 6.6 (Petroleum Safety Zone) PTTEP AA Offtake Operations – Facility Information Requirements (MV-OP-D32-808302) which manages all offtake tanker movements and operations. Relevant personnel will have the following qualification - Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95). Standard maritime safety procedures for supply vessels in accordance with Marine Orders Part 30 including 24hr watch, radio contact and display of navigational lights and beacons Montara Bilge, Ballast and Cargo System Performance Standard (MON-FPSO-P48) will be implemented to ensure inspection, monitoring and maintenance of cargo pumps and associated equipment. Montara Shipboard Oil Pollution Emergency Plan (SOPEP) (MV-HSE-D30-812013)	Medium

Hazard	Potential Impacts	Management Measures	Residual Risk
		includes procedures for minimising loss to marine environment from tank rupture. Response undertaken in accordance with the accepted Montara Operations OSCP.	
Small surface release of hydrocarbon Crude - Maximum volume - 30m^3 Rupture or improper connection/ disconnection of product transfer hoses	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality, toxicological effects and oiling of islands and emergent coral reefs.	PTTEP AA Offtake Operations – Facility Information Requirements (MV-OP-D32-808302) which manages all offtake tanker movements and transfer operations. Montara Shipboard Oil Pollution Emergency Plan (SOPEP) (MV-HSE-D30-812013) includes procedures for minimising loss to marine environment for spills onboard. Response undertaken in accordance with the accepted Montara Operations OSCP.	Medium
Small surface release of hydrocarbon from the wellhead platform or FPSO due to equipment failure or vessel collision	Impacts on marine flora and fauna and habitats include coating and/ or smothering, contamination and mortality, toxicological effects and oiling of islands and emergent coral reefs. Disruption of commercial fishing activities.	Compliance with PTTEP AA Montara Structural Integrity Management Manual - WHP and FPSO Topsides (MV-MN-D33-812058) will be implemented to ensure inspection, monitoring and maintenance of WHP and FPSO equipment. All supply vessel movements will be in accordance with the Supply Vessel Operations Procedure (D32-500798-FACCOM). Establishment of a 500m zone around facilities to ensure restricted and controlled vessel access to within close proximity of facilities in accordance with Maritime Transport and Offshore Facilities Security Regulations 2003 Division 6.5 (Offshore Waterside Restricted Zone) and OPGGSA Section 6.6 (Petroleum Safety Zone) PTTEP AA Offtake Operations – Facility Information Requirements (MV-OP-D32-808302) which manages all offtake tanker movements and operations. Relevant personnel will have the following qualification - Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95). Standard maritime safety procedures for supply vessels in accordance with Marine Orders Part 30 including 24hr watch, radio contact and display of navigational lights and beacons PTTEP AA Corrosion Management Strategy (MV-MN-D33-812291) which includes	Low

Hazard	Potential Impacts	Management Measures	Residual Risk
		monitoring of corrosion to ensure the technical integrity of wellhead platform infrastructure and pipelines.	
Discharge of Treated Water - hydrotest, and Dewatering operations during Commissioning and Maintenance	Localised and temporary impacts to water quality and marine fauna in open ocean waters.	All treated water will be treated through the PFW treatment system prior to discharge. PTTEP AA Produced Water System Operating Procedure Manual (MV-OP-D32-807731), which includes calibration, sampling, monitoring, maintenance, emergency and shutdown procedures. PTTEP AA Approval and Control of Hazardous Substances (S32-501162-CORP), which specifies the process to assess and review chemicals used offshore.	Low
Routine discharge of treated PFW to the marine environment.	Temporary and localised toxic effects to marine biota within approximately 250 m of the discharge point due to discharge of residual scale and corrosion inhibitors and biocides. Localised decline in water quality - Elevated temperatures within approximately 100 m of the discharge point.	OPGGS(E)R 29(1), specifically the concentration of petroleum in any PFW discharged is < 30 mg/L over any period of 24 hours. OPGGS(E)R 29A(1), specifically regular accepted testing of PFW to assess the performance of the monitoring equipment and the results recorded via compliance with PTTEP AA Environmental Emissions Monitoring and Control (MV-HSE-D30-811922) which includes tests to ensure PFW oil in water analyser, handheld (HACH meter), flowmeter and diverter valves are functioning and calibrated. PTTEP AA Produced Water System Operating Procedure Manual (MV-OP-D32-807731), which includes sampling, monitoring, maintenance, emergency and shutdown procedures. PTTEP AA Approval and Control of Hazardous Substances (S32-501162-CORP), which specifies the process to assess and review chemicals used offshore. Condition (3) EPBC 2002/755 – If PFW monitoring indicates the volumes exceed 30,000bpd, a PFW Plan will be provided to the Minister (SEWPAC, now DoE) for approval. Establishment of a 500m PFW mixing zone and PFW Adaptive Management Strategy which includes periodic PFW and environmental monitoring.	Low

Hazard	Potential Impacts	Management Measures	Residual Risk
Discharge of Foam during Fire System testing	Localised and temporary impacts to water quality and marine fauna in open ocean waters.	PTTEP AA Approval and Control of Hazardous Substances (S32-501162-CORP), which specifies the process to assess and review chemicals used offshore. PTTEP AA Automatic Fire Protection System Performance Standard (MV-HSE-030-811903), which includes operation and maintenance procedures in line with the manufacturer's specifications, to ensure efficient operation and minimum discharge required to test the equipment.	Low
Cooling Water and Brine Discharge	Localised decline in water quality associated with reduced dissolved oxygen concentrations (resulting from increased water temperature) and toxicity due to the use of biocide additives.	Cooling water effluent temperature does not exceed 3ºC greater than ambient water temperature outside of 100m from point of discharge and annual marine environmental monitoring undertaking to verify. PTTEP AA Marine Seawater System Operating Procedure Manual (MV-OP-D32-807745), which includes sampling, monitoring, maintenance, emergency and shutdown procedures.	Low
Non Hazardous Discharges Routine discharge of treated sewage, grey water, and putrescible wastes to the marine environment from FPSO and support vessels	Localised and temporary impacts to water quality (i.e. nutrient enrichment) in surface waters. Attraction of marine fauna in the vicinity of the FPSO.	Compliance with PTTEP AA Sewage/ Black/ Grey Water Operating Manual (MV-OP-D32-807748), which includes design, monitoring and maintenance, emergency and shutdown procedures and detection systems and alarms. Compliance with Montara Waste Management and Discharges Procedure (MV-HSE-D30-821338), which details waste production streams, garbage collection points and segregation, waste handling and disposal, incident reporting, record keeping, training and awareness and review and auditing to ensure correct discharge of sewage, grey water and putrescibles waste to the marine environment. This plan includes MARPOL requirements.	Low
Deck Drainage and Bilge Discharge Routine discharges of deck drainage and bilge to the marine environment.	Localised and temporary impacts to water quality and marine fauna in open ocean waters.	Compliance with Montara Waste Management and Discharges Procedure (MV-HSE-D30-821338), which details incident reporting, bunding of hydrocarbon areas with potential for hydrocarbon storage and contamination, record keeping, training and awareness, review and auditing and compliance of FPSO and supply vessels specifying a discharge limit of 15mg/L in discharged oily water from bilges and drainage. Compliance with PTTEP AA Montara Structural Integrity Management Manual - WHP and FPSO Topsides (MV-MN-D33-812058) will be implemented to ensure inspection,	Low

Hazard	Potential Impacts	Management Measures	Residual Risk
		monitoring and maintenance of WHP and FPSO equipment, including the deck drainage systems. PTTEP AA Flare and Drainage Systems Operating Manual (MV-OP-D32-807735), which includes monitoring, maintenance, emergency and shutdown procedures.	
Control Fluid Discharge Subsea discharge of control fluids due to valve operations in subsea equipment	Localised and temporary impacts to water quality and marine fauna in open ocean waters.	PTTEP AA Montara Subsea Integrity Management Plan (MV-MN-D33-812441) which includes inspection, monitoring and maintenance of subsea equipment. PTTEP AA Approval and Control of Hazardous Substances (S32-501162-CORP), which specifies the process to assess and review chemicals that are used offshore.	Low
Introduction of invasive marine species Transport/ introduction of invasive marine species (IMS) in vessel ballast water.	Introduction and establishment of IMS and displacement of native marine species through increased competition, predation or changes to the marine ecosystem.	Compliance with PTTEP AA Contractor Management Standard (SSHE-106-STD-310) that requires compliance with: AQIS Australian Ballast Water Management Requirements including all foreign ballast water exchanges conducted more than 50 nm from land and in greater than 200 m water depth. DAFF (2011) Australian Ballast Water Management Requirements (Version 5).	Low
Introduction of invasive marine species. Transport/ introduction of IMS on hull, internal niches and in-water equipment (biofouling).	Introduction and establishment of IMS and displacement of native marine species through increased competition, predation or changes to the marine ecosystem.	Biofouling risk assessment of Montara Venture FPSO and location undertaken of the site in accordance with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia 2009) Supply vessels and offtake tankers have valid antifouling certification.	Low
Vessel and Helicopter Movements. Interaction with marine fauna during supply vessel movement	Injury/mortality of marine fauna, particularly cetaceans and turtles, from a vessel collision.	EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans: (i) Support vessels will not travel greater than 6 knots within 300 m of a whale and approach no closer than 100 m from a whale; and (ii) Helicopters shall not operate lower than 500 m or within the horizontal radius of 500 m of a whale known to be present in the area.	Low

Hazard	Potential Impacts	Management Measures	Residual Risk
Artificial Light from illumination of WHP, FPSO, export tankers and supply vessels for safety purposes	Attraction of marine fauna to the MDP causing potential changes in predatory/ prey behaviour.	Maintain levels of lighting on FPSO, WHP and vessels to as low as reasonably practical that still comply with navigational requirements and allow safe operations.	
Noise from standard operation of FPSO, supply vessels and helicopters.	Potential impacts to marine fauna include damage to the auditory system, behavioural change, avoidance, temporary shift in hearing thresholds and interference with acoustic signals.	EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans which state: • Support vessels will not travel greater than 6 knots within 300 m of a whale (caution zone) and approach no closer than 100 m (no approach zone) from a whale. • Helicopters shall not operate lower than 1,650 ft (500 m) or within the horizontal radius of 500 m of a whale known to be present in the area. Preventative maintenance system ensures maintenance of engines and equipment to operate efficiently and minimise excess noise from FPSO.	Low
Interference of other users of the area 500m safety zone established around the FPSO and WHP which excludes non-authorised vessels	Interference with commercial fishing vessels, commercial shipping, and other marine users. Interruption to MDP (e.g. supply vessels to/ from FPSO) due to damage to commercial vessels or fishing gear.	OPGGSA Section 280 - Interference with Others Rights Key stakeholders will be advised of the safety and exclusion zones associated with the MDP and a Notice to Mariners Issued by the Australian Hydrographic Office Establishment of 500m zone around facilities to ensure restricted and controlled vessel access to within close proximity of facilities in accordance with Maritime Transport and Offshore Facilities Security Regulations 2003 Division 6.5 (Offshore Waterside Restricted Zone) and OPGGSA Section 6.6 (Petroleum Safety Zone)	Low
Solid Waste Discharges. Accidental release of solid non-biodegradable, non-hazardous waste.	Decline in water quality. Potential injury to fauna via the ingestion of plastics and entanglement in wastes.	Compliance with Montara Waste Management and Discharges Procedure (MV-HSE-D30-MV-HSE-D30-821338), which details waste production streams, garbage collection points and segregation, waste handling and disposal, incident reporting, record keeping, training and awareness and review and auditing to ensure effective and efficient waste handling and disposal. Plan includes requirements for FPSO and supply vessels to comply with MARPOL. All waste transfers undertaken in accordance with Supply Vessel Operations Procedure	Low

Hazard	Potential Impacts	Management Measures	Residual Risk
		(D32-500798-FACCOM).	
Hazardous Waste Discharges Accidental release of hazardous waste, due to inadequate storage, cleaning, transfer or disposal procedures.	Decline in water quality. Toxic effects to marine biota.	Compliance with Montara Waste Management and Discharges Procedure (MV-HSE-D30-MV-HSE-D30-821338), which includes requirements for waste production streams, garbage collection points and segregation, waste handling and disposal, incident reporting, record keeping, training and awareness and review and auditing. All waste transfers undertaken in accordance with Supply Vessel Operations Procedure (D32-500798-FACCOM). Naturally Occuring Radioactive Materials (NORM) will be monitored for and managed if identified in accordance with the Radiation Protection Plan (D30-504340-FACCOM).	Low
Air Emissions - Flaring of gases encountered from the oil extraction process resulting on the releases of emissions	Minor reduction in air quality and contribution to the cumulative build-up of greenhouse gas (GHG) in the atmosphere.	PTTEP AA Flaring Minimisation Procedure (MV-PN-D32-811858), which details measures to minimise the volume of gas flared during operations by not flaring gas other than during process upset or emergency conditions. PTTEP AA's Montara Venture Energy and Emissions Estimation Procedure (MV-HSE-D30-814057), which includes recording and reporting requirements of emissions to ensure compliance with National Greenhouse and Energy Reporting (NGER) and National Pollutant Inventory (NPI) reporting records.	Low
Air Emissions – Power generation for machinery and vessel operations and engine use of FPSO, support vessels and helicopters.	Contribution to the cumulative build-up of GHG in the atmosphere.	FPSO and supply vessels possess Protection of the Sea (Prevention of Pollution from Ships) Act 1983 – Part IIID, MARPOL Annex VI- Marine Orders – Part 97: Marine Pollution Prevention - Air Pollution as appropriate to class. PTTEP AA Montara Structural Integrity Management Manual - WHP and FPSO Topsides (MV-MN-D33-812058) will be implemented to ensure inspection, monitoring and maintenance of WHP and FPSO equipment.	Low
Air Emissions - Release of ozone depleting substances.	Contribution to the cumulative build-up of ozone depleting substances in the atmosphere.	PTTEP Montara Refrigerant and Ozone Depleting Substance Management Plan (MV-HSE-D30-813784), which details maintenance and routine checks, storage, transportation and reporting in line with regulatory requirements for FPSO equipment.	Low

Hazard	Potential Impacts	Management Measures	Residual Risk
Air Emissions – Venting of gas containing volatile VOCs from storage infrastructure resulting in release of emissions.	Minor reduction in air quality and contribution to the cumulative build-up of GHG in the atmosphere.	PTTEP AA Montara Structural Integrity Management Manual - WHP and FPSO Topsides (MV-MN-D33-812058) will be implemented to ensure inspection, monitoring and maintenance of WHP and FPSO equipment, including all storage infrastructure. PTTEP AA's Montara Venture Energy and Emissions Estimation Procedure (MV-HSE-D30-814057), which includes recording and reporting requirements of emissions to ensure compliance with National Greenhouse and Energy Reporting (NGER) and National Pollutant Inventory (NPI) reporting records.	Low