CITIC PACIFIC MINING

SINO Iron Project

Operational Environmental Management Plan

APPENDIX C - Part 1

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Appendix C PART 1

SINO Iron Project, Cape Preston Port Environmental Management Plan, Stage 1 Port Operational Activities - November 2011 (Version 15)

Sino Iron Project

Cape Preston

Port Environmental Management Plan

Stage 1 Port Operational Activities

Developed by CITIC Pacific Mining Management Pty Ltd with the assistance of Oceanica Consulting Pty Ltd.

November 2011(Version15)

EXECUTIVE SUMMARY

1 INTRODUCTION

This document is a Port Environmental Management Plan (PEMP) for the Sino Iron Project (the Project) at Cape Preston located some 60 km southwest of the Port of Dampier in the Pilbara region of WA. The Sino Iron Project was submitted as a Proposal under the *Environmental Protection Act 1986* and approved by the Minister for the Environment in October 2003. It has been prepared in response to Condition 9 and Commitment 10 of Ministerial Statement 635. The proponent for the purposes of Ministerial Statement 635 is Mineralogy Pty Ltd ("Proponent") and the Proposal involves the construction and operation of an iron ore mine, ore processing, port facilities, a power station and a desalination plant at Cape Preston.

CITIC Pacific Mining Management Pty Ltd (CPM) has subsequently purchased the mining rights for the George Palmer ore-body from the Proponent via the Sino Iron takeover agreement, which includes the right to proceed with further assessment and development of the Project. CPM will manage the development of the ore-body and associated processing and export infrastructure and will function as the Project Manager on behalf of Sino Iron, while Mineralogy will remain the Project proponent under Ministerial Statement 635.

Since the Minister for the Environment approved the implementation of the original Proposal in 2003, CPM has carried out extensive port design studies including geotechnical investigations and bathymetric surveys in order to finalise the Project's port design and operational methods. The port facilities have been detailed in the Marine Management Plan (MMP) (Le Provost Environmental, 2008a), which covered the requirements of Condition 7. A construction Environmental Management Program (EMPgm) for marine facilities (Phase 3) was developed, covering the requirements of Commitment 2, to address marine related construction activities. The MMP and EMPgm were approved by the EPA in March 2009. This PEMP covers the operational aspects of the port and specifically addresses Condition 9. The management and operation of the desalination plant brine outfall is covered by Ministerial Statement 822.

2 THE PORT

The Project port infrastructure is required to support a cargo wharf, tug berth, offloading platforms and trestle jetty.

Port facilities will consist of:

- Port lay-down and materials handling area
- A stockpile yard and associated buildings
- A solid rock causeway running in a north-northwest direction from Cape Preston to the east of Preston Island
- A breakwater running to the west from the outer end of the causeway to provide protection for vessels
- A small craft harbour, materials offloading facility (MOF) and service wharf to accommodate the loading or unloading of general cargo
- A heavy lift barge unloading ramp allowing barges to berth and unload (modular) outsize loads onto a ramp
- Associated infrastructure running along the causeway
- Tug pens/berth

- Associated port infrastructure (e.g. workshops, offices, fuel storage facilities control rooms, parking areas etc).
- A trestle jetty and indicative shipping route for loading and access of vessels. Dredging of the shipping route may occur at a later stage, and when this occurs this PEMP will be amended accordingly
- Barge loaders and transshipment facility

The operations covered by this Port EMP include:

- Incoming vessels bringing in equipment and goods to the MOF and service wharf
- Barge loading, transportation and loading of ocean going vessels (OGVs) using transhipment equipment
- Monitoring and reporting

Risk assessment work has confirmed that the key risks associated with these activities include hydrocarbon spills and the introduction of invasive marine species. These risks are covered by specific management plans that have been prepared by expert consultants and are appended to this PEMP. In addition to these risks, management of runoff and product spillage is covered by this plan.

3 MONITORING

Ongoing monitoring of the receiving environment will be undertaken to ensure that the operation of the port does not have a detrimental impact on surrounding ecosystems. Environmental monitoring will include:

- Sediment quality
- Coral health
- Light spill
- Invasive Marine Pests

4 REPORTING

The results of monitoring will be reported to the office of the Environmental Protection Authority and the Department of Environment and Conservation through the following processes:

1. Monitoring results will be included in the Project Annual Report (Part IV)
2. Compliance reporting will be reported annually as required by operating licences (Part V)
3. Performance review of the monitoring data every six years as required under Statement 635 (Part IV).

5 REVISIONS

As per Ministerial Statement 635 any significant amendments to the PEMP will be referred to the EPA. In addition to this the Department of Fisheries (DoF) will also be consulted with any changes in relation to the management of invasive marine pests and ballast water management.

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1.1 PROJECT BACKGROUND

Mineralogy Pty Ltd (the Proponent) for the purposes of Ministerial Statement 635 proposes to develop an iron ore mine, processing plant and port facility in the general location of Cape Preston, approximately 80 km southwest of Karratha. The Project was assessed by the Environmental Protection Authority (EPA) pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) at Public Environmental Review (PER) level. The PER (Austeel, 2000) was submitted to the EPA in December 2000. To address changes to the Project design being sought by the Proponent, a Supplementary Environmental Review (SER (Austeel, 2002)) was submitted to the EPA in February 2002. The Minister for the Environment approved the implementation of the proposal through the issue of Statement 635 in October 2003.

CITIC Pacific Mining Management Pty Ltd (CPM) purchased the mining rights for the George Palmer ore-body from the Proponent via the Sino Iron takeover agreement that includes the right to proceed with further assessment and development of the Sino Iron Project (the Project). CPM will manage the development of the ore-body and associated processing and export infrastructure and will function as the Project Manager on behalf of Sino Iron, while Mineralogy will remain the Project proponent under Ministerial Statement 635.

Since the Minister for the Environment approved the original Proposal to be implemented in 2003, CPM has carried out extensive port design studies including geotechnical investigations and bathymetric surveys in order to finalise port design and operational methods. The port facilities have been detailed in the Marine Management Plan (MMP) (Le Provost Environmental, 2008a), which covered the requirements of Condition 7. A construction Environmental Management Program (EMPgm) – Phase 3, marine activities was developed, covering the requirements of Commitment 2, to address marine related construction activities. The MMP and EMPgm were approved by the EPA in March 2009. The management and operation of the desalination plant brine outfall is covered by Statement 822. This PEMP covers the operational aspects of the port and specifically addresses Condition 9 of Statement 635.

1.2 SCOPE AND PURPOSE OF THIS DOCUMENT

The purpose of this Port Environmental Management Plan (PEMP) is to satisfy Condition 9, Commitment 7 and Commitment 10 of Statement 635. The MMP (LeProvost Environmental 2008a) and the EMPgm (LeProvost Environmental 2008b) allowed port construction to commence as it addresses respectively requirements of Condition 7 and Commitment 2. This PEMP should be read in conjunction with aforementioned reports.

1.2.1 Staging of Port Development

This PEMP has been developed to address the impacts of Stage 1 port operational activities, which are defined as the operation of the transshipment facility and all facilities inside the breakwater (Figure 1 & 2). Facilities include the materials offloading facility (MOF), service wharf, barge loading facility, cargo wharf, tug berth, lay-down areas and other associated minor jetties, moorings and infrastructure (e.g. offices, control rooms, fuel storage facilities, workshops).

The reason for limiting this PEMP to Stage 1 activities is that it removes the risk associated with export vessels docking at the trestle jetty (with regards to introducing Invasive Marine Species (IMS)), and allows this document to accurately reflect the operations that are due to occur in the near future.

Therefore, this document and its appendices cover all impacts associated with the operation of the breakwater port facilities and transshipment.

Stage 2 port activities will include the operation of the trestle jetty and associated infrastructure. Final designs for the trestle jetty have not yet been completed, and a full IMS risk assessment is also required for associated Ocean Going Vessels (OGVs) berthing at the trestle jetty. This document will be updated when required to incorporate the operation of the trestle jetty.

The Oil Spill Contingency Plan (OSCP) (Appendix 1) for the port however has been developed for all possible shipping scenarios, including Ocean Going Vessels (OGVs) docking at the trestle jetty. This was developed early as it was simple to determine what potential scenarios could arise from the operation of all stages of the approved port.

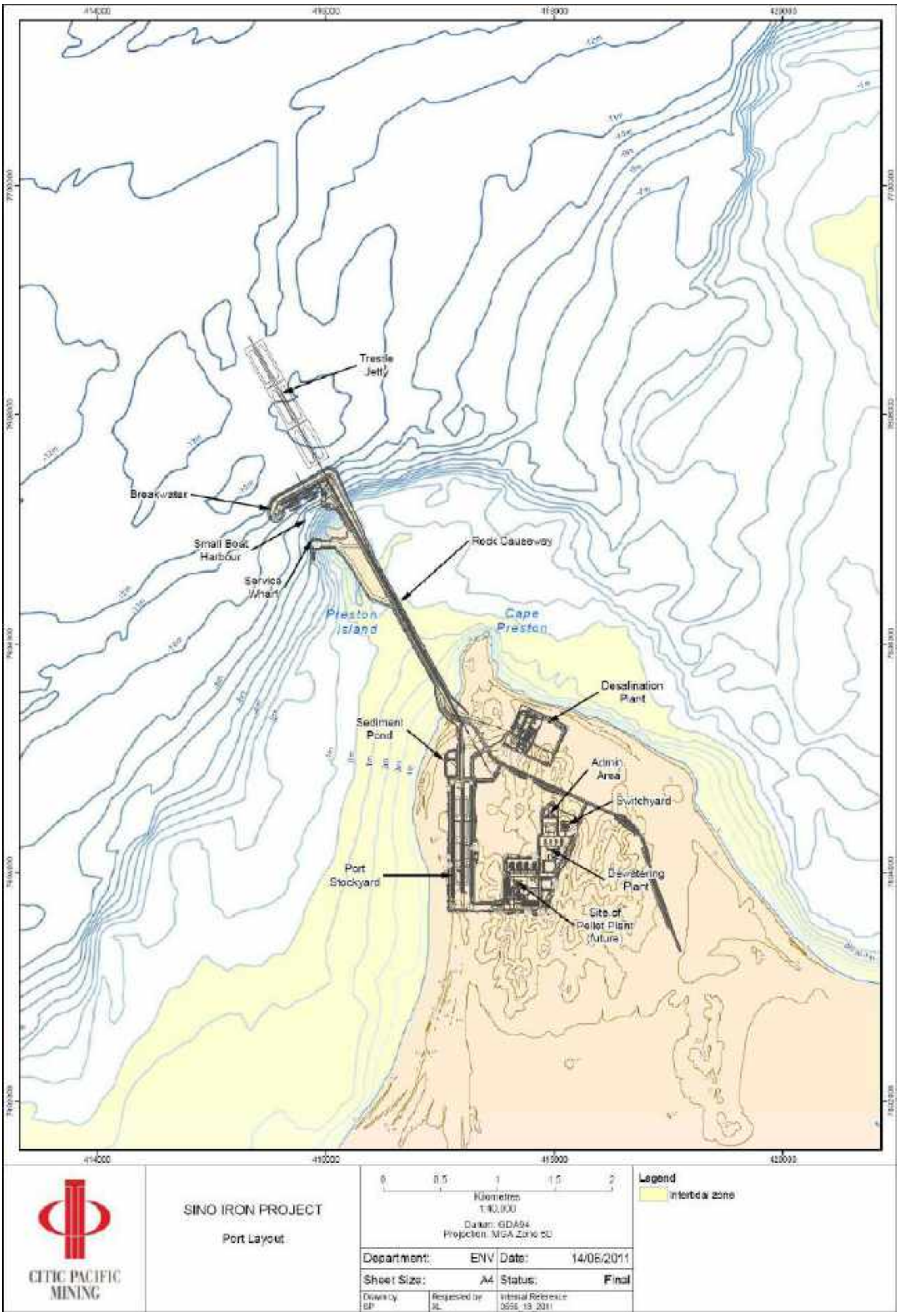

Figure 1 Port location and layout

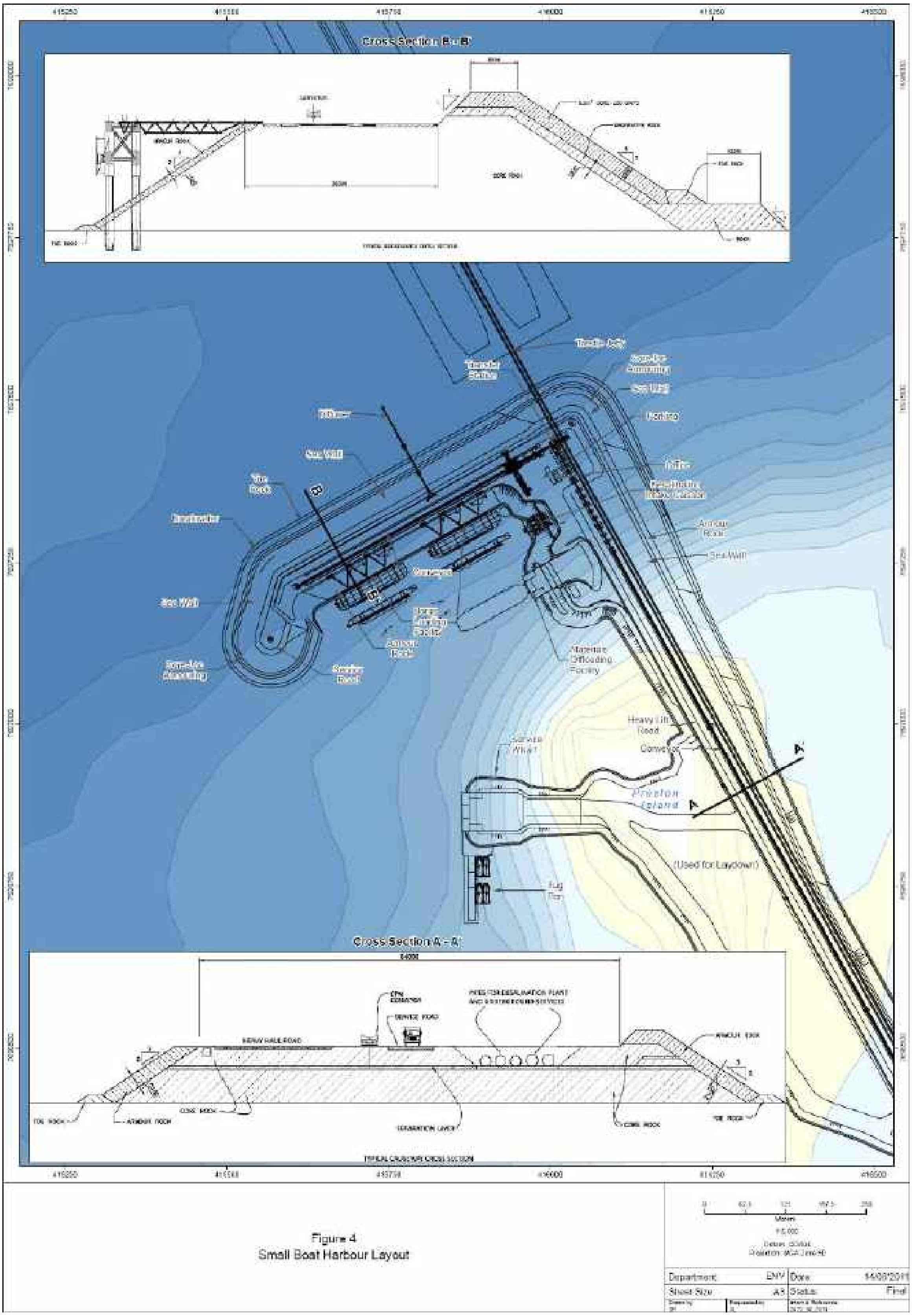

Figure 2 Breakwater Layout

1.2.2 **Statement 635**

This PEMP has been prepared to address Condition 9, Commitment 7 and Commitment 10 of Statement 635.

Condition 9 of Statement 635 states:

9 Port Environmental Management Plan

9-1 Prior to the commencement of ground-disturbing activities at Cape Preston or Preston Island (whichever is the sooner), the proponent shall prepare a Port Environmental Management Plan to address emissions from the port berthing facility, product-handling facilities, desalination plant, and associated structures, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

This plan shall also be submitted to the Department of Conservation and Land Management (now Department of Environment and Conservation (DEC)) *and the Department of Fisheries.*

The objectives of this Plan are:

- *to maintain an adequate level of water quality in waters surrounding the port;*
- *to minimise runoff and spills;*
- *to avoid ballast water contamination and the introduction of exotic marine organisms from ships' hulls; and*
- *to contain light spill so as to minimise impacts on turtles.*

This Plan shall:

1 establish Environmental Quality Objectives (EQO) which explicitly identify uses and values and where they will be protected, and the appropriate Environmental Quality Criteria required to sustain each Environmental Quality Objective.

The Environmental Quality Objectives will include:

- *the ecosystem health objective (EQO 1) as defined in the Environmental Protection Authority document Perth's Coastal Waters, Environmental Values and Objectives in the zones delineated in Figure 2 of schedule 1;*
- *fishing and aquaculture objectives (EQO 2) in the zones delineated in Figure 2 of schedule 1; and*
- *recreational and aesthetic objectives (Environmental Quality Objectives 3 and 4, respectively) in the zones delineated in Figure 2 of schedule 1.*

***Note**: The above Environmental Quality Objective zones are subject to review in both extent and the guideline values and standard criteria applying to them, and may be varied from time to time on advice of the Environmental Protection Authority.*

2 ensure that light spill is contained to minimise impacts on turtles;

3 ensure that runoff and spills are contained;

4 incorporate an Oil Spill Contingency Plan;

5 incorporate a Ballast Water Management Plan; and

6 include a Hull-fouling Organisms Management Plan, which includes a risk assessment and a baseline marine survey for benthic and planktonic organisms in the area designated *for ship berthing to minimise the risk of introduction of exotic marine organisms from ships' hulls*

9-2 The proponent shall implement the Port Environmental Management Plan required by condition 9-1.

9-3 The proponent shall make the Port Environmental Management Plan required by condition 9-1 publicly available, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Commitment 7 of Statement 635 committed the Proponent to '*prepare a Ballast Water Management Plan*' prior to operations and implement the plan during operations on advice from the Australian Quarantine Inspection Service (AQIS). The Plan is required to contain '*plans, guidelines and procedures on the methods to be employed to minimise the potential release of exotic organisms'.* The objective of the Plan is '*to minimise the potential release of exotic organisms to the marine environment'.*

Commitment 10 of Statement 635 committed the Proponent to '*prepare and implement (as necessary) a Spill Contingency Plan'* prior to operations on advice from the Australian Maritime Safety Authority. The Plan is required to contain '*plans, guidelines and procedures to manage any spillage'*. The objective of the Plan is '*to ensure protection of the marine environment from spills'.*

1.2.3 Document structure and analysis of conditions

Table 1 outlines the sections in which the requirements of Condition 9-1 are addressed.

Table 1 Statement 635 conditions and where they are addressed in the PEMP

Condition item	Topic	Comments	Section where addressed
Condition 9-1, Item 1	Establish EQOs which explicitly identify uses and values and where they will be protected, and the appropriate Environmental Quality Criteria (EQC) required to sustain each EQO. The EQO will include: ▪ the ecosystem health objective (EQO 1) as defined in the EPA document *Perth's Coastal Waters, Environmental Values and Objectives* in the zones delineated in Figure 2 of schedule 1; ▪ fishing and aquaculture objectives (EQO 2) in the zones delineated in Figure 2 of schedule 1; and ▪ recreational and aesthetic objectives (EQO 3 and 4, respectively) in the zones delineated in Figure 2 of schedule 1.	The reference to Figure 2 of Schedule 1 is incorrect as Figure 2 does not show any EQO zones. Therefore the zone boundaries have been identified to be consistent with the document '*Pilbara Coastal Water Quality Consultation Outcomes'* and are shown on Figure 16.	Section 6.1
Condition 9-1, Item 2	Ensure that light spill is contained to minimise impacts on turtles	Light impacts on turtles have been adequately addressed in CPM's approved Fauna Management Plan (Appendix 3). A summary of lighting controls is included in this document.	Section 5.2
Condition 9-1, Item 3	Ensure that runoff and spills are contained	Addressed in this document	Section 5
Condition 9-1, Item 4	Incorporate an OSCP	Included as an appendix	Appendix 1

Condition 9-1, Item 5	Incorporate a Ballast Water Management Plan	Included as an appendix	Appendix 2
Condition 9-1, Item 6	Include a Hull-fouling Organisms Management Plan, which includes a risk assessment and a baseline marine survey for benthic and planktonic organisms in the area designated for ship berthing to minimise the risk of introduction of exotic marine organisms from ships' hulls	Included as an appendix	Appendix 2

1.3 OTHER RELEVANT DOCUMENTS

The port will be designed, constructed and operated in compliance with Statement 635. Statement 635 requires the preparation of the following two marine environmental management plans (EMPs) for the Project:

- Marine Management Plan (MMP) (Condition 7)
- PEMP (Condition 9)

In addition a EMPgm for marine facilities (Phase 3) was submitted to address the construction impacts of the port, as well as a Fauna Management Plan (FMP) which addresses impacts on turtles and shorebirds.

Recognising the need for these plans to be submitted and approved in a logical sequence, the MMP (LeProvost Environmental, 2008a) and EMPgm (LeProvost Environmental, 2008b) were identified as the EMPs that required approval prior to port construction commencing.

It should be noted that Condition 7-1 5 (Marine Management Plan) and 8-1 to 8-4 (Marine Wastewater Outfall) of Statement 635 were deleted and replaced by Statement 822, which addresses the construction and operation of the wastewater outfall. Port operations will commence subject to approval of this PEMP (Figure 3).

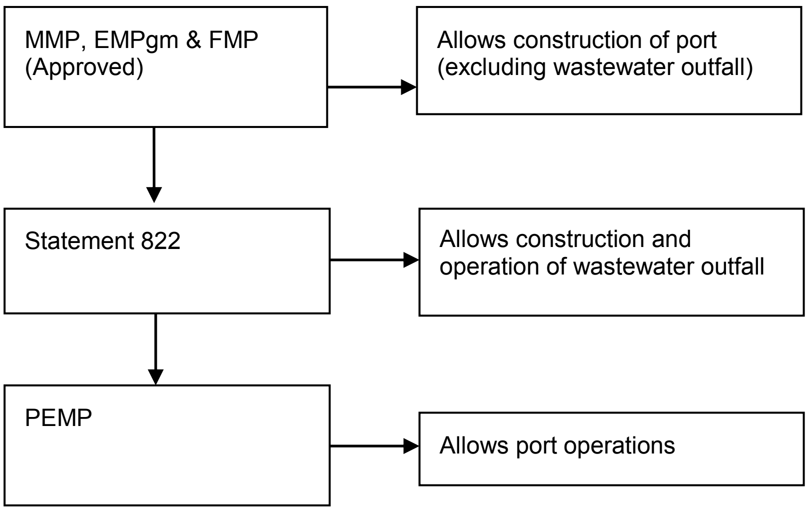

Figure 3 Sequence for implementation of marine EMPs

1.4 APPLICABLE POLICY AND GUIDELINES

1.4.1 Proposed Regnard Marine Management Area

The proposed Regnard Marine Management Area is mooted for the mainland coastal areas extending from Eaglehawk and West Intercourse Islands westwards to South West Regnard Island (Figure 4).

This management area replaces the former proposed Cape Preston Marine Management Area (CALM 2005) that extended to the west of Cape Preston as far as the Fortescue River mouth. The westward extension of the proposed Cape Preston Marine Management Area has now been deleted as this included proposed port facilities and areas covered by State Agreements Acts (pers comm. Dr F Stanley, DEC, 2009).

DEC has been preparing for the formal gazettal of the proposed Regnard Marine Management Area under the provisions of the *Conservation and Land Management Act 1984*. It is understood that gazettal has been delayed to a future date that is yet to be determined (pers comm. Kath Simpson, DEC, October 2008).

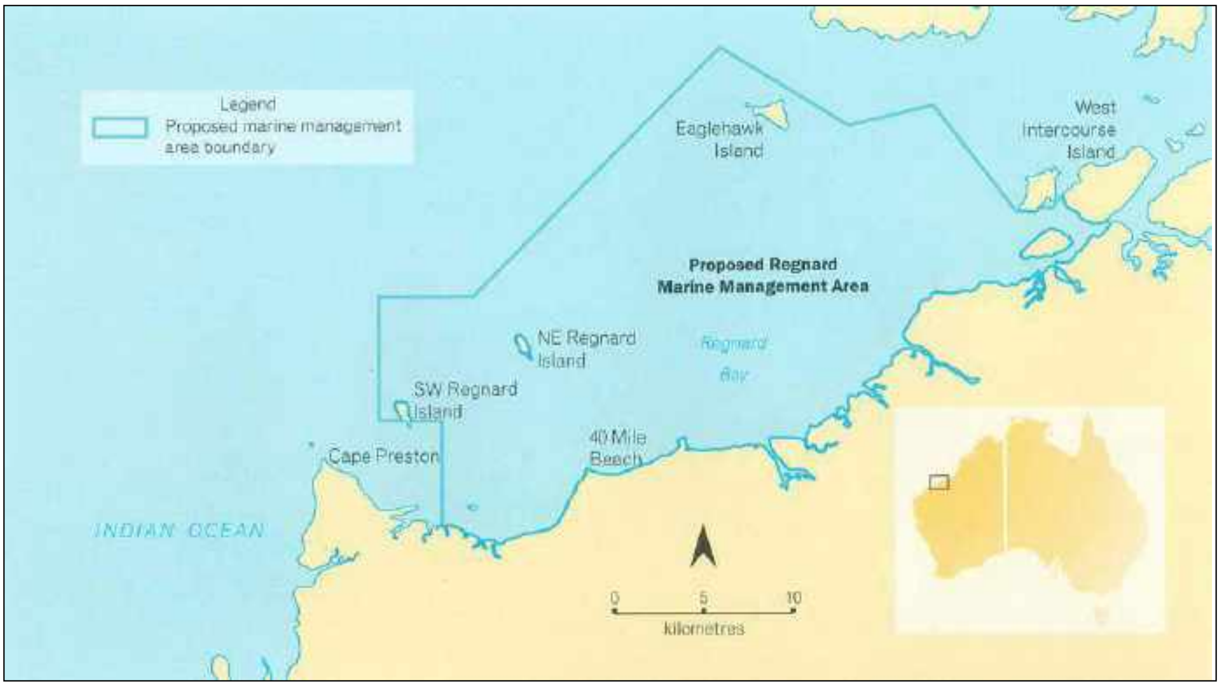

Figure 4 Proposed Regnard Marine Management Area

1.4.2 Pilbara Coastal Water Quality Consultation Outcomes

In late 2004 DEC ran a series of targeted workshops on the establishment of environmental values (EVs) and EQOs for the State marine waters between Exmouth Gulf and Cape Keraudren.

The results of consultation undertaken and recommendations to the EPA are published in *Pilbara Coastal Water Quality Consultation Outcomes – Environmental Values and Environmental Quality Objectives* (DEC, 2006). The recommendations of this report have now been endorsed by the EPA as a framework for environmental impact assessment, waste discharge regulation and natural resource management in the Pilbara marine environment. It is understood that the EPA/DEC has recommended the use of DEC (2006) and associated ecological protection maps as a guiding document until such time as more formal government policy, such as a State Environmental Policy, is developed (pers comm. K McAlpine, DEC, April 2008).

The EVs and their associated EQOs as endorsed by the EPA are as follows:

- Ecosystem Health (ecological value)
  - Maintain ecosystem integrity.
- Recreation and Aesthetics (social use value)

- Water quality is safe for recreational activities in the water (e.g. swimming)
- Water quality is safe for recreational activities on the water (e.g. boating)
- Aesthetic values of the marine environment are protected.

- Cultural and spiritual (social use value)
  - Cultural and Spiritual values of the marine environment are protected.
- Fishing and Aquaculture (social use value)
  - Seafood (caught or grown) is of a quality safe for eating
  - Water quality is suitable for aquaculture purposes.
- Industrial Water Supply (social use value)
  - Water quality is suitable for industrial supply purposes.

In developing the Ecosystem Health EV, different levels of ecological protection have been developed for application to Pilbara coastal waters (Table 2). The spatial application of the EVs and EQOs to the waters around Cape Preston is outlined in Figure 5.

Table 2 Levels of Ecological Protection for Maintenance of Ecosystem Integrity

Level of Ecological Protection	Environmental Quality Condition (limit of acceptable change)	
	Contaminant concentration indicators	**Biological indicators**
Maximum	No contaminants – pristine	No detectable change from natural variation
High	Very low levels of contaminants	No detectable change from natural variation
Moderate	Elevated levels of contaminants	Moderate changes from natural variation
Low	High levels of contaminants	Large changes from natural variation

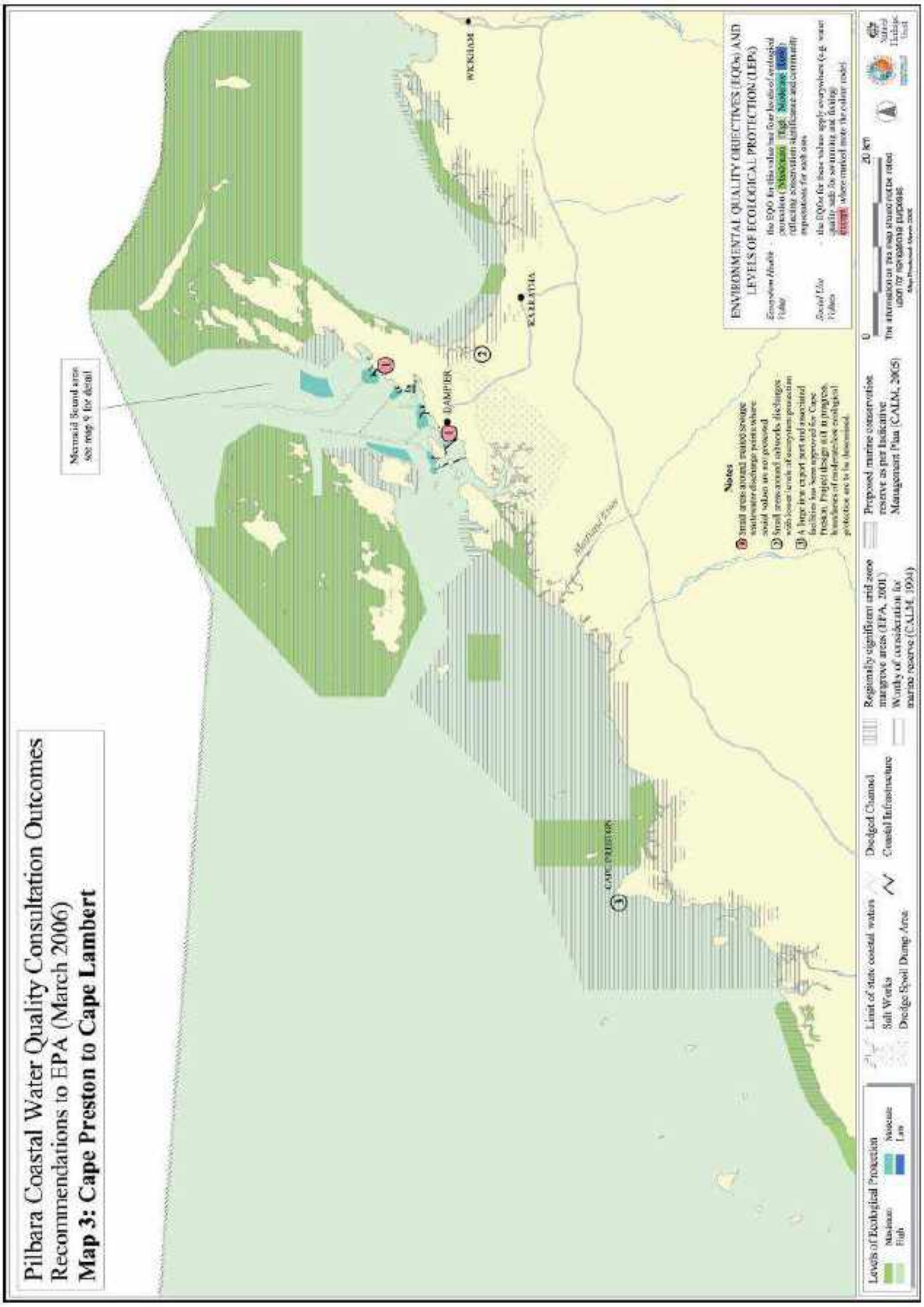

Figure 5 Environmental values and quality objectives developed for Cape Preston waters

Note: Figure 5 shows the former proposed Cape Preston Marine Park, which has now superseded by the proposed Regnard Marine Management Area (refer to Section 1.4.1).

1.4.3 EPA Guidance Statement No. 29: Benthic Primary Producer Habitat Protection for WA's marine environment

EPA Guidance Statement No. 29 (EPA, 2004) sets out a framework for the assessment of proposals that may impact on benthic primary producers (BPP) and the habitats that can or do support such communities, termed benthic primary producer habitats (BPPH). EPA (2004) considers that BPP are 'predominantly marine plants (e.g. seagrasses, mangroves, seaweeds and turf algae), but include invertebrates such as scleractinian corals'.

Guidance Statement No. 29's risk-based approach to assessing any implication for BPPH ecosystem integrity sets out several steps. The first is the definition of a 'Management Unit' for the purposes of applying Guidance Statement No. 29. The Guidance Statement considers that "a Management Unit would normally be approximately 50 km² (e.g. a rectangular area defined by a 10 km stretch of coastline extending 5 km offshore)" (EPA, 2004). The purpose of the Guidance is to focus the mind of proponents on the need to ensure that a proposed Management Unit is reasonable and defendable when considering the impact of a proposal on the ecological value and function (integrity) of the habitat of a specified BPP.

EPA (2004) defines six categories of marine ecosystem protection and provided guidance on the amount of BPPH that may be lost due to development as a percentage of BPPH within a defined Management Unit for each category. These percentages are termed 'cumulative loss thresholds' (CLT) that, if exceeded, will be used by the EPA as indicative of potential non-acceptability. However, given the difficulty of reliable measurement of the area of some BPPH, and considering the difficulty of quantifying the ecological significance of their loss, these thresholds will not be used as rigid limits. The acceptability of BPPH damage/loss will in all cases be judged by the EPA based primarily on its assessment of the overall risk to the ecosystem integrity within a defined Management Unit if a proposal were allowed to be implemented.

The six categories of marine ecosystem protection, and their corresponding CLTs, are summarised in Table 3.

Table 3 Cumulative loss thresholds for BPPH within defined Management Units for six categories of marine ecosystem protection

Category	Description	**CLT*** (percentage of original BPPH within a defined Management Unit)
A	Extremely special areas	0%
B	High protection areas other than above	1%
C	Other designated areas	2%
D	Non-designated area	5%
E	Development areas	10%
F	Areas where cumulative loss thresholds have been significantly exceeded	0% net damage/loss (+offsets)

*Thresholds will be applied only after proponents can demonstrate to the EPA that all options to avoid/minimise damage/loss of BPPH have been considered.

1.4.4 Great Sandy Islands Nature Reserve

The Great Sandy Island Nature Reserve (GSINR) encompasses the islands off the Pilbara coast within an area extending generally from about 15 km east of Cape Preston to the mouth of the Robe River, and ranging from approximately 10 to 35 km offshore. The GSINR covers more than 30 islands, including Preston Island, but does not include the surrounding marine waters.

Preston Island has no sandy beach area to support turtle nesting. In reporting on the Project, the EPA considered that:

> *On its own Preston Island is not considered to have intrinsically high conservation values. It is a small, low rocky platform with little vegetative cover* (EPA, 2002).

Preston Island will be utilised by the Project port as the port includes a rock causeway between Cape Preston and the eastern edge of Preston Island, and a lay down area for the marine construction and operational activities on Preston Island. Preston Island will also be utilised to provide access to the service wharf and the tug berth.

1.4.5 National Biofouling Management Guidelines (Commercial Vessels)

The National Biofouling Management Guidelines for Commercial Vessels has been developed by the Commonwealth, State & Territory governments, marine industry, researchers and conservation groups. It outlines operational procedures and provides information which allows commercial operators to implement to prevent marine pest introductions and translocations.

These guidelines contain the ANZECC Code of Practice for Antifouling and In-water Hull Cleaning and Maintenance. The Ballast Water and Bio-Fouling Management Plan (Appendix 2) has been based around these Guidelines and Code.

2. STAKEHOLDER CONSULTATION

Stakeholders for the Project were originally identified by the Proponent. All stakeholders consulted during the preparation of the PER and SER were provided with details of the project key characteristics, including mining, processing and infrastructure requirements, and environmental studies undertaken. This consultation process provided stakeholders with an overview of the Project, including the port operations.

Agencies/groups consulted include:

- DEC Regional Office
- Department of Mines and Petroleum (DMP)
- The Shire of Roebourne
- Representatives of local native title claimant groups
- Mardie Station Pastoral Lease Holder
- DEC Environmental Management Branch

2.1 DEC REVIEW OF A PREVIOUS VERSION OF THE PEMP

A draft PEMP was provided to DEC in 2006 for an outdated port design. The comments received are included in Appendix 4 along with responses as to how the issues raised have been dealt with in this PEMP.

2.2 EPA SITE VISIT

On 2 April 2009, members of the EPA were shown around the site, including the Cape, and gained a greater understanding of the Project. The site visit included a bus tour of the mine site and a helicopter flight over the Project area. The group visited Cape Preston, where the port layout and marine EMPs were discussed.

2.3 GOVERNMENT AGENCIES SITE VISITS

CPM and Mineralogy have hosted a number of Project site visits by officers from numerous Government agencies and since 2006. Such site visits have proved invaluable to the development of a constructive ongoing relationship with Government agencies responsible for Project regulation.

2.4 MEETINGS WITH EPA SERVICE UNIT

CPM and the Proponent have met with the EPA Chairman and senior officers of the EPA Service Unit (now Office of the EPA (OEPA)) on several occasions since 2008 to discuss the Project port, and finalisation of the marine related EMPs.

3. ENVIRONMENTAL BASELINE

3.1 CLIMATE

Cape Preston is located towards the west of the North West Shelf, experiencing a subtropical (or sub-monsoonal) climate. Synoptically, the region is dominated by relatively diffuse extra-tropical high-pressure systems, although during the summer months, the influence of tropical low-pressure systems increases. The meteorology of the North West Shelf is controlled by two main seasons, referred to here as 'cool' and 'warm'; there are short transition seasons between these two main seasons. The cool season typically extends from May to August, with the warm season normally from October through March (Pearce *et al.,* 2003).

Overlying the prevailing seasonal winds is local circulation brought about by land/sea breeze cells. These cause a regular diurnal variation in the strength and direction of winds, for approximately 5 - 20 km both landward and seaward from the coast. Although these cells are strongest during the warm season, they may occur at any time of year. The warm season is largely coincident with the tropical cyclone season, which may produce intense, mobile low-pressure systems. These are capable of producing extreme winds and are generally associated with the most extreme rainfall, wave and surge conditions across the North West Shelf (GEMS, 2008a).

During the cooler months a high-pressure ridge controls the winds over the region; this ridge is a persistent feature over the southern part of Western Australia. The ridge drives easterly winds across the shelf region. Frontal systems moving through mid latitudes periodically erode the ridge; winds then shift to the north-east, with subsequent rotation through south-west to south-east following frontal passage. A new high pressure will then re-establish the pattern; during this phase, periods of more persistent and stronger easterly winds can be expected to influence Cape Preston.

During the warmer months, the sub-tropical ridge migrates southwards and the dominant synoptic feature is a permanent heat trough that develops inland from the Pilbara coast. This pattern produces quasi-permanent south-west wind flow across the Shelf region. Fluctuations in the intensity and location of the heat trough as well as diurnal and local topographic influences affect day-to-day variations in wind direction and speed within the general south-west flow (GEMS, 2008a)

Monthly variation of the wind climate has been described by GEMS (2008a) using the Bureau of Meteorology MesoLAPS dataset. The corresponding monthly wind roses are presented in Figure 6 for the Cape Preston area.

On average, five tropical cyclones pass through the Western Australian region each year, although this may be highly variable on a year-to-year basis. Cyclones are typically generated offshore from the Kimberley, although they may be generated across a broader range of longitudes under suitable conditions. Although the Cape Preston region is to the south of the zone with the highest frequency of cyclone events, it still experiences significant onshore winds and therefore enhanced wave energy.

It is well known that the Cape Preston-Mardie Station region is subject to intense cyclonic activity, with the most severe storm on record, Severe Tropical Cyclone Vance (1999), causing extensive coastal inundation between Onslow and North West Cape. In 1989 another severe cyclone (Orson) crossed the coast close to Cape Preston. More recently, during the 2005-06 season, two cyclones (Clare and Glenda) also crossed the coast in the Cape Preston region.

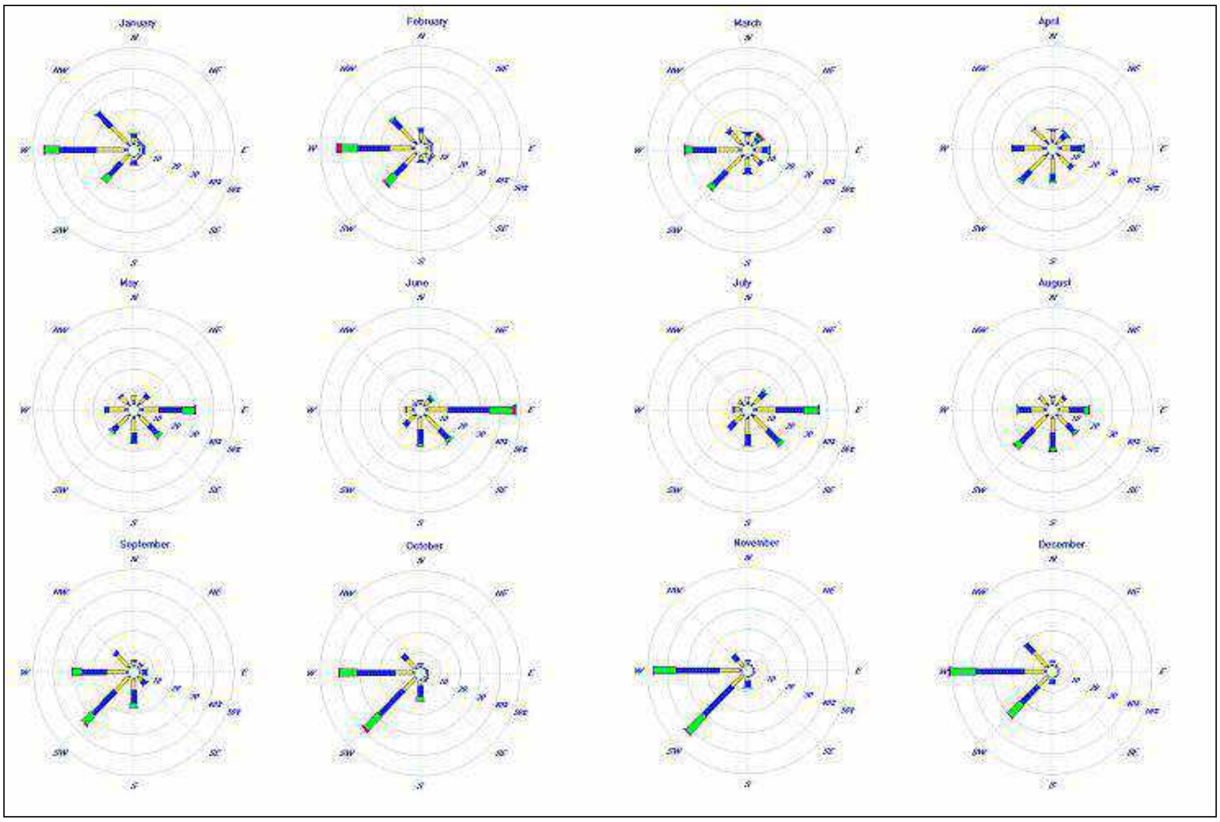

Figure 6 Monthly Wind Roses for Cape Preston

3.2 SEAWATER QUALITY

The nearshore waters at the tip of Cape Preston are controlled by the seawater quality of the regional area. The Cape's waters are well mixed by wind and the large tidal movements that occur in the region. Though a nearshore–offshore gradient in the physical properties of the seawater is likely to be present (CALM 2005), this gradient is not expected to be steep and the water quality of the region should largely be representative of the local waters off Cape Preston.

The following paragraph is a summary of information provided by CALM (2005) in relation to the former (proposed) Cape Preston Marine Management Area:

> *"The waters of the proposed reserves are relatively undisturbed by anthropogenic sources. Near-shore water movements and mixing patterns in the Dampier Archipelago/Cape Preston region are driven primarily by large tidal ranges, local currents and winds, but are also influenced by seabed topography and the steering effect of islands and reefs. Sea-surface temperatures within the Dampier Archipelago range from about 18ºC in winter to 31.5ºC in summer, with near-shore waters having a greater seasonal temperature range than the offshore waters. The smallest range and lowest salinities (35.1 to 36.1 ppt) occur offshore at the 20 m contour, and the largest range and highest salinities (35.45 to 37.1 ppt) occur inshore within 2 km of the Burrup Peninsula. Salinity and temperature differences between the nearshore and mid-shelf regions are expected to drive gentle cross-shelf circulation in the region."*

3.2.1 **Temperature**

The sea surface temperature for the Dampier Archipelago was reported by CALM (2005) to range from 18°C in winter to 31.5°C in summer, with a greater temperature range expected in nearshore waters compared to offshore waters. Due to the proximity and the similarity of the environments, the waters at Cape Preston would be expected to have a similar temperature range and monitoring undertaken at Cape Preston is consistent with this temperature range (Table 4).

Monitoring data has been collected by various companies from 2000 to 2008 in the inshore waters off Cape Preston, both in the immediate vicinity of the development, and from the surrounding waters:

- in February 2000 by DA Lord & Associates (DAL 2000)
- in 2002 and 2006 by Maunsell (Maunsell 2002)
- on several occasions in 2007 and once in May 2008 by URS (URS 2007, URS2008a)

The summary data from these studies is presented in Table 4. All data was collected as profiles or at intervals down through the water column, with temperature ranges within or very close to that reported for the sea surface waters of the Dampier Archipelago. Temperature profiles obtained by Maunsell (2006) in November found the water column to be relatively well mixed throughout the 21 survey sites at Cape Preston. The temperatures rarely varied more than 0.1ºC from surface to bottom at any one site, with the maximum temperature variation recorded as less than 1ºC.

Table 4 Temperature data from inshore waters off Cape Preston

Company	Timing	No. of sites	Type of measurement	Mean (°C)	Min (°C)	Max (°C)
DAL	February 2000	10 (36 readings)	Data point every 0.5m	30.19	29.52	30.90
Maunsell	November 2002	6 (10 profiles)	Handheld logger, yellow spring instruments (YSI)	26.08	25.58	26.33
Maunsell	July 2004	15 (15 profiles)	YSI	20.92	20.02	21.17
URS	February 2007	1 (1 profiles)	YSI	30.60		
URS	March 2007	2 (2 profiles)	YSI	30.07		
URS	April 2007	2 (2 profiles)	YSI	30.09		
URS	April 2007	2 (2 profiles)	YSI	30.24		
URS	June 2007	2 (2 profiles)	YSI	23.45		
URS	May 2008	1 (10 readings)	Data point every 1m	26.55	26.56	26.54

3.2.2 **Dissolved oxygen, pH, TSS and turbidity**

Turbidity in the region is generally high, due to the episodic high volume river flows, dominant marine sediment types, strong local winds, large tides and common occurrences of cyanobacterial blooms; *Oscillatoria* (*Trichodesmium*) (Maunsell 2006). Turbidity is typically higher in the shallow near-shore areas than in the deeper sites further offshore and can vary considerably on a spatial scale, due to localised re-suspension of sediments, and temporally depending on wind and tide.

Turbidity data collected by URS in 2007 ranged from 0 to 23 nephelometric turbidity units (NTU). The high turbidity readings (>20 NTU) are believed to be associated with an algal bloom event and not caused by physical processes. A 'peak' primary production event (*Oscillatoria* (*Trichodesmium*) bloom) was observed during the survey on 4 April 2007. During this event, average NTU values increased approximately 10 fold, and pH and oxygen values changed accordingly (Table 5).

Data collected by URS in 2007 at two locations near-shore to Cape Preston (Table 5) found waters to be supersaturated (>100%) with dissolved oxygen (DO) and with high pH values (>8.1). These results were consistent with a survey undertaken by URS in May 2008 at Cape Preston (Table 6).

TSS data obtained by URS during 2007 and 2008 indicate that ambient concentrations range between 2 mg/L and 10 mg/L.

The pH values in 2008 were all higher than 8.6, which is above the recommended guideline value of 8.4 for inshore and 8.2 for offshore tropical marine waters (ANZECC/ARMCANZ 2000a). The combination of high pH values with supersaturated water was attributed to high photosynthetic consumption of carbon dioxide, which occurs especially during algal blooms. The 2008 survey was undertaken during neap tides on 16 May and found no vertical stratification of the water column (Table 6). There was also a phytoplankton bloom observed on this day, providing an explanation for the high pH and DO levels.

Table 5 Mean water quality characteristics during the 2007 surveys

Site	Site 1					Site 2			
Date	27-Feb-07	22-Mar-07	4-Apr-07	19-Apr-07	7-Jun-07	22-Mar-07	4-Apr-07	19-Apr-07	7-Jun-07
DO (mg/L)	5.96	6.77	8.74	6.87	8.81	6.87	8.29	6.85	8.74
DO (%)	99.99	112.85	144.05	115.16		113.94	136.13	115.31	
pH	8.21	8.20	7.62	8.40	8.11	8.18	7.81	8.39	8.12
Turbidity (NTU)	2.69	2.28	22.35	2.24	3.45	2.46	22.43	2.08	3.21
Conductivity (mS/cm)	54.58	54.81		56.43	53.98	54.48		56.52	53.74

Table 6 Physical characteristics of the water column - May 2008, URS (2008a)

Temperature	DO	DO	pH	Turbidity	Salinity	Depth
°C	mg/L	% saturation		NTU	ppt	m
26.55	6.63	100.00	8.64	0.40	35.10	0.50
26.55	6.63	100.00	8.64	0.40	35.10	1.50
26.55	6.63	100.00	8.64	0.40	35.10	2.00
26.54	6.68	100.80	8.64	0.40	35.10	3.00
26.55	6.66	100.50	8.64	0.40	35.20	4.00
26.54	6.71	101.20	8.64	0.60	35.10	5.00
26.55	6.67	100.70	8.64	0.50	35.20	6.00
26.56	6.71	101.30	8.64	0.80	35.20	7.00
26.55	6.71	101.20	8.64	1.20	35.20	8.00
26.55	6.64	100.10	8.64	1.50	35.10	9.00

3.2.3 Nutrients

Nutrient and chlorophyll-*a* concentrations obtained for Austeel (Maunsell 2002) were all found to be slightly above ANZECC/ARMCANZ (2000a) guideline values for inshore marine waters in tropical Australia. The ANZECC/ARMCANZ (2000a) guideline values are:

- Chlorophyll-*a*: 0.7-1.4 µg/L
- Ortho-phosphorus: 5 µg/L
- Nitrate+nitrite: 2-8 µg/L
- Ammonium: 1-10 µg/L

DAL (2000) also reported elevated nutrient concentrations; with median ammonium 19 µg/L, ortho-phosphorus 3 µg/L, nitrate plus nitrite 38.5 µg/L and median chlorophyll-a was 1.73 µg/L.

The data collected to date suggests that the waters around Cape Preston have elevated primary productivity compared to other areas, which may be a result of the occasional large contributions of terrigeneous sediment to the area from Fortescue River flows.

3.2.4 Trace metals

In 2003, DEC undertook an extensive study to characterise background levels of key trace metals in the area around the Dampier Archipelago and in and near Port Hedland (Wenziker et al. 2006).

Wenziker et al. (2006) analysed for six key trace metal elements: cadmium, chromium, copper, lead, mercury and zinc. It was concluded that the levels of these trace metals in 'unimpacted' seawater were low and found to be similar to those measured in an equivalent study of the coastal waters off Perth (McAlpine et al. 2005). They were also generally comparable with those found in coastal waters off the New South Wales coast (Apte et al. 1998) and with those of surface waters of the Pacific Ocean (Wenziker et al. 2006). In conclusion, the trace metal levels found on the unimpacted sites in the Dampier Archipelago/Port Hedland study were interpreted as plausible background values for North West Shelf waters in general. All values were well below the 99% species protection level, and it was expected that other trace metal levels would also naturally be below the 99% species protection levels. However, until further data is collected, the 99/95% species protection level (Table 7) is recommended to be used as a guideline for unimpacted sites of the North West Shelf (Wenziker et al. 2006).

The background values found in the study are considered to be applicable to the waters off Cape Preston due to its proximity, similar geology and similar marine environment to that of the Dampier Archipelago and the consistency of results found in seawaters around Australia.

Table 7 Estimated natural background concentration (Wenziker et al. 2006)

Analyte	Dampier Archipelago (µg/L)	North West Shelf (µg/L)	99% species protection level[1] (µg/L)	99/95% species protection level[2] (µg/L)
Cadmium	0.005	0.005	0.7	0.7
Total chromium	0.18	0.17	7.7 (Cr III) 0.14 (Cr VI)	27.4 (Cr III) 4.4 (CrVI)
Copper	0.12	0.165	0.3	1.3
Lead	0.01	0.01	2.2	4.4
Total mercury	0.0004	0.0004	0.1	0.1
Zinc	0.14	0.20	7	15

[1] ANZECC/ARMCANZ (2000)

[2] Recommended guideline values for use for unimpacted waters of the North West Shelf region (Wenziker et al. 2006).

Water quality surveys that included sampling for heavy metals have been undertaken at Cape Preston on a number of occasions by various survey teams; Maunsell in 2002, and URS on several occasions in 2007, and once in 2008. In these studies, the analyses were conducted using relatively high laboratory limits of reporting (LORs) (rather than ultra-trace techniques) which were frequently higher than the 99/95% species protection levels that are relevant to the assessment of any potential impacts. Therefore, these datasets are not deemed suitable for determining baseline levels of these metals for this study.

The results of these surveys, an analysis of the techniques used and why they are not being included in this baseline assessment are presented in Appendix 5.

3.2.5 Baseline water quality conclusions

Although the salinity, pH, temperature and DO data collected are indicative of the local conditions, the data is not suitable for deriving site specific criteria in such a variable environment.

High levels of mercury, lead, zinc, cadmium, copper and arsenic reported sporadically in local surveys which did not use ultra-trace techniques for sampling, preservation and analysis, are considered unlikely to be representative of natural background levels at Cape Preston (Appendix 5).

As was reported in the pilot study undertaken by Wenziker et al. (2006), cross contamination of water samples may still occur, even when considerable care is taken in the field.

Consequently, the Dampier Archipelago background values are considered the most applicable baseline to the inshore waters off Cape Preston and the ANZECC/ARMCANZ (2000a) 99% species protection levels, as modified by EPA (2005a) will be the most appropriate trigger values for assessing compliance with Condition 9-1, Item 1. The Proponent's objective will be to ensure that water quality beyond the boundary of the port Moderate Ecological Protection Area (MEPA) meets these criteria (Table 7).

3.3 HYDRODYNAMICS

This section provides some background information on the physical characteristics of the offshore environment at Cape Preston to provide context for the assessment of potential port operational impacts.

3.3.1 Bathymetry

The intertidal and nearshore areas of Cape Preston are made up of a shallow platform that extends from a few kilometres southwest of Cape Preston to approximately 30 km northeast to Eaglehawk Island. The intertidal platform contains two islands (SW and NE Regnard) and numerous shoals. Preston Island is located near the tip of this platform, approximately 1.2 km to the north of Cape Preston. At low spring tide, the water between the island and the mainland can be very shallow as the depth is less than 1 m chart datum (CD). To the southwest of Preston Island, the seabed is less than 8 m CD in depth, but drops to over 13 m CD approximately 300 m offshore to the north and northwest. Deeper waters of greater than 20 m CD do not occur until about 16 km offshore to the north (Figure 7; URS 2008b).

3.3.2 Circulation

Circulation in the waters off Cape Preston is mostly influenced by the North West Shelf tides with some influence from episodic strong surface winds. Tides are relatively strong off Cape Preston with a spring tidal range of 4.75 m. Surface current velocities can reach 0.75 m/s (1.5 knots) during spring tides and 0.25 m/s (0.5 knots) during neap tides. The combination of strong tidal currents and surface winds result in limited opportunity for stratification to occur in the waters off Cape Preston (GEMS 2008).

The dominant flushing mechanism at Cape Preston is the ebb tide which generally flows north-northwest from the site around the Montebello Islands. There is also a relatively strong residual current to the northeast driven by the south-westerly winds and the ebb tide (GEMS 2008).

The majority of the flood tide reaches Cape Preston from the open ocean by going around the Montebello Islands and then flowing southwards towards the coast. When the flood tide reaches Cape Preston it splits around the Cape with flow occurring to the southwest and southeast along the coast.

Waves along the North West Shelf are generated from the following sources:

- Southern Ocean swell, propagating past Northwest Cape
- winter easterly swell generated across the Timor Sea
- locally generated wind waves
- wind waves generated by tropical cyclones

Cape Preston is exposed to a relatively mild ambient wave climate that has a typical significant wave height of one metre. Waves during the summer months generally approach Cape Preston from the northwest due to the prevailing westerly winds, while wave conditions during winter are more variable, reflecting the wider range of potential wave sources described above, however the waves mostly approach from the north or north-northeast (GEMS 2008).

The effect of tropical cyclones is episodic, with the capacity to produce waves from any offshore direction depending on the path of the system. The most severe conditions are produced by cyclones located approximately 20 to 60 km west of Cape Preston, causing extreme wave and surge conditions.

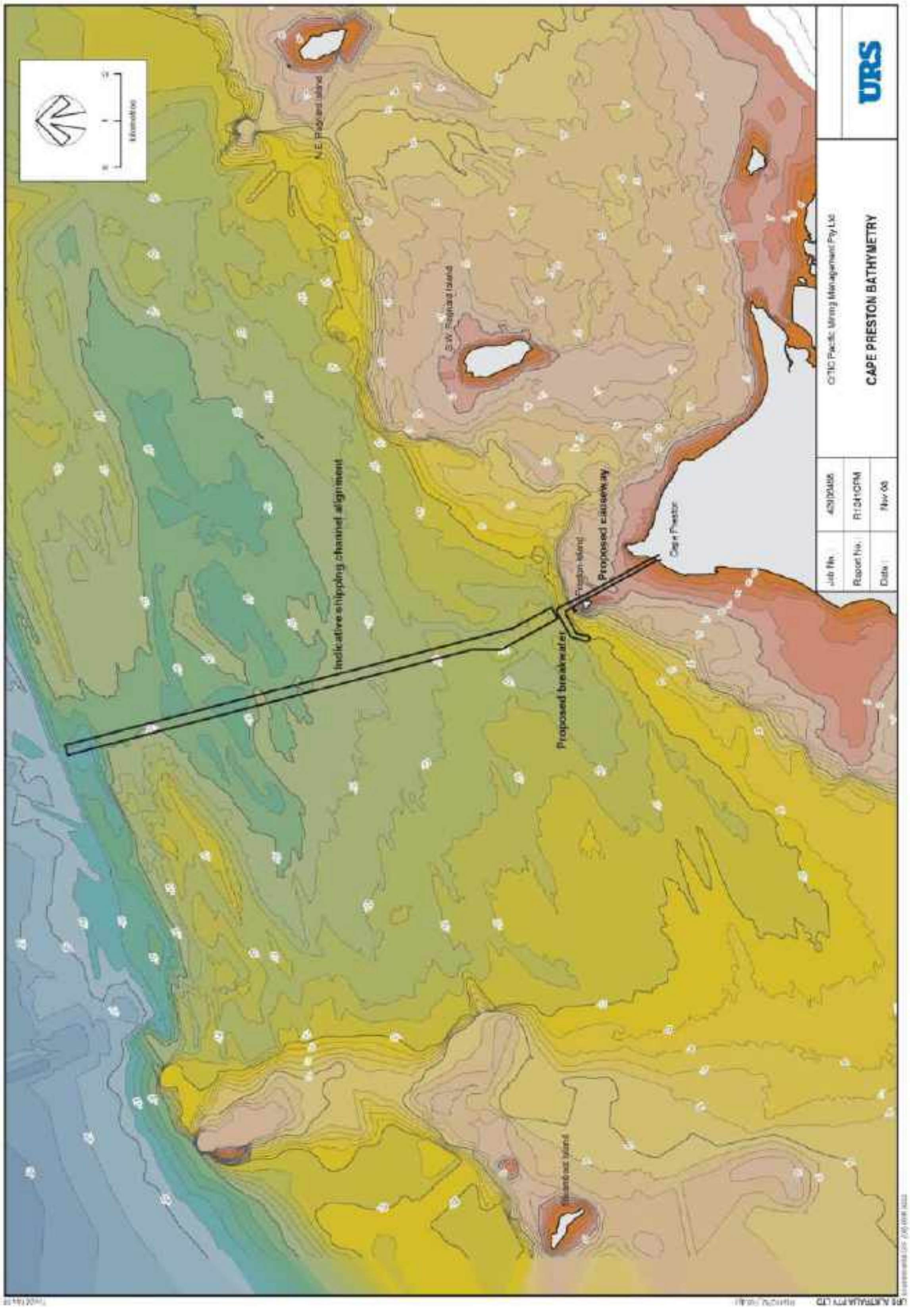

Figure 7 Cape Preston bathymetry

3.4 BIOLOGICAL

The area in the immediate vicinity of the port offshore from Cape Preston is relatively barren silty sand substrate with limited amounts of algae on the seafloor.

Further offshore from the port in deeper water, scattered and sometimes dense patches of ephemeral *Halophila sp.* seagrass occur. Sparse patches of this species of seagrass were also recorded in small areas west of SW Regnard Island and west of Fortescue Island.

South of the port is a thin corridor of low to moderate density coral communities ranging from less than 10% to over 25% in coral coverage. These coral communities border the steep slope that descends from the shallow algae dominated pavement to the deep sandy floor, and generally have a low diversity except in a small fringe along the steep slope that runs around the northwest corner of Preston Island. About 2 km to the east of the port is another low density (less than 10%) coral community (Figure 8, URS 2008b).

The nearest major reefs which support high live coral cover are located as follows (URS 2008b):

- approximately 3 – 5 km to the southwest of Cape Preston
- 4 km to the east-north-east of Cape Preston on the southeast end of SW Regnard Island
- 5 km east of Cape Preston

These reefs support up to 100% live coral cover and are comprised primarily of large colonies of massive species such as *Porites*, *Favites*, *Lobophylia* and *Goneastera*. These reefs are old and have survived many cyclones although evidence of cyclone damage is abundant (URS 2008b).

Marine fauna appearing in either Schedule 1 of the *Wildlife Conservation Act 1950*, listed under the Australian Government *Environment Protection and Biodiversity Conservation Act 1999* or DEC's Priority Fauna list that are known to occur in near coastal waters or have been recorded locally include:

1. **Marine Turtles**: Results from surveys indicate that the beaches of Cape Preston are utilised for a limited amount of turtle breeding activities and near-shore sub-tidal areas are likely to provide habitat for turtle feeding activities.
2. **Dugongs:** In the Dampier Archipelago/Cape Preston region, small numbers of dugongs (*Dugong dugon*) have been sighted in the shallow, warm waters in bays and between islands, including at Cape Preston. Current knowledge on the size of the population, distribution, migratory habits and regional and local importance of the Dampier Archipelago/Cape Preston area for dugongs is limited (Le Provost 2008a).

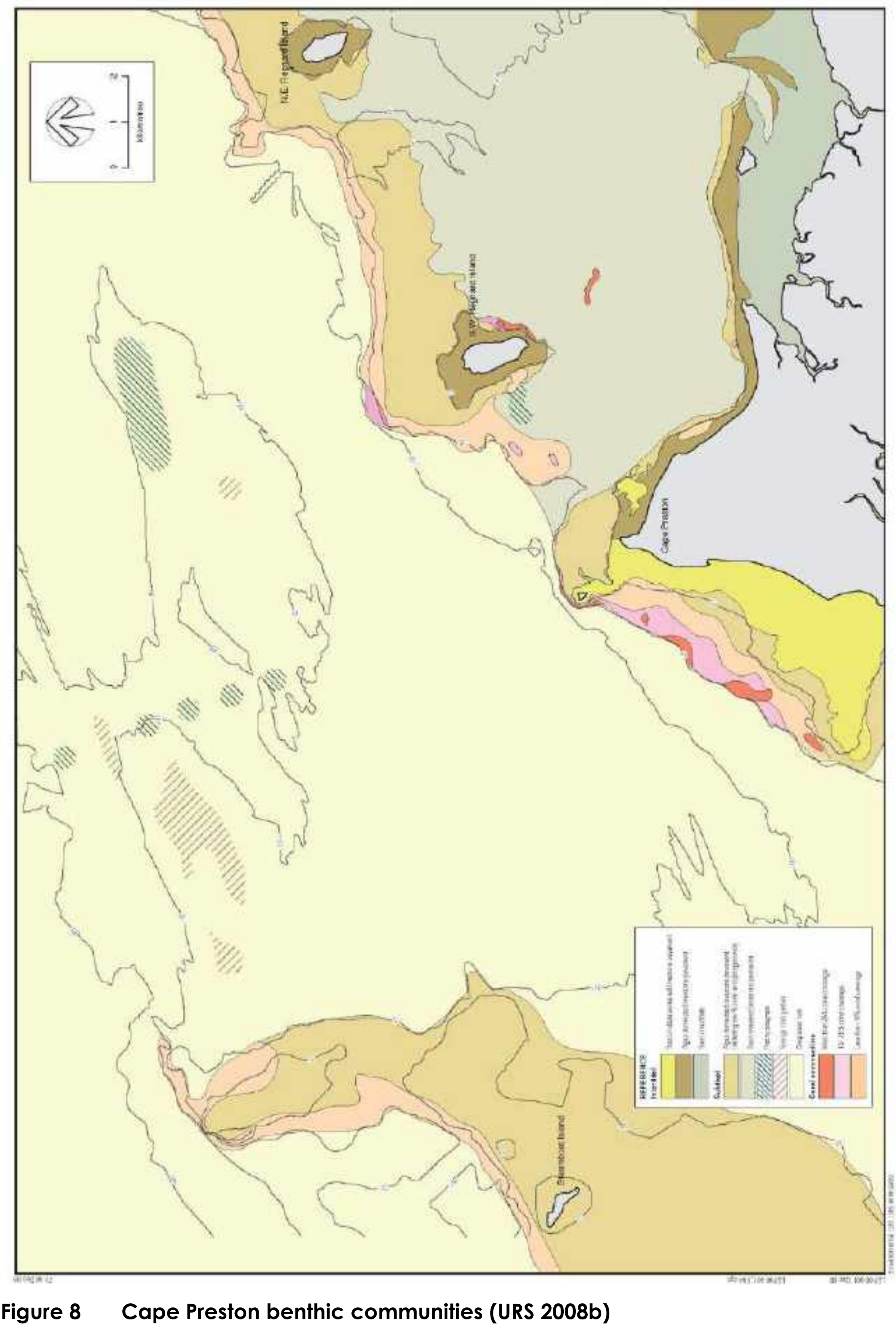

Figure 8 Cape Preston benthic communities (URS 2008b)

3.5 RECREATIONAL USES AND AQUACULTURE

The waters and shallow marine habitats of Regnard Bay are fished recreationally by low numbers of visitors from Dampier and by itinerant public campers that occupy the 40 Mile Beach camping area during winter months. The waters on the west side of Cape Preston are similarly fished recreationally by visitors from Pannawonica and by public campers that occupy the Fortescue River Mouth camping area during winter (Figure 9).

The deeper waters to the west of Cape Preston are used occasionally by Onslow based prawn trawlers. The Onslow Prawn Managed Fishery operates along the western part of the North West Shelf and targets western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus spp*.) and banana prawns (*Penaeus merguiensis*) using otter trawl. The governing legislation/fishing authority is the Onslow Prawn Fishery Management Plan 1991 and the Onslow Prawn Managed Fishery Licence. Cape Preston falls in both Fishing Area 3 and the Fortescue Nursery Area of the Onslow Prawn Managed Fishery.

There are two aquaculture lease sites within the vicinity of Cape Preston; one west of Cape Preston and one west of NE Regnard Island (Figure 9). The Project port does not fall within either of these leases.

The mainland immediately adjacent to Cape Preston, Regnard Bay and the Fortescue River is zoned for industrial use, and is covered by *Mining Act 1978* tenements.

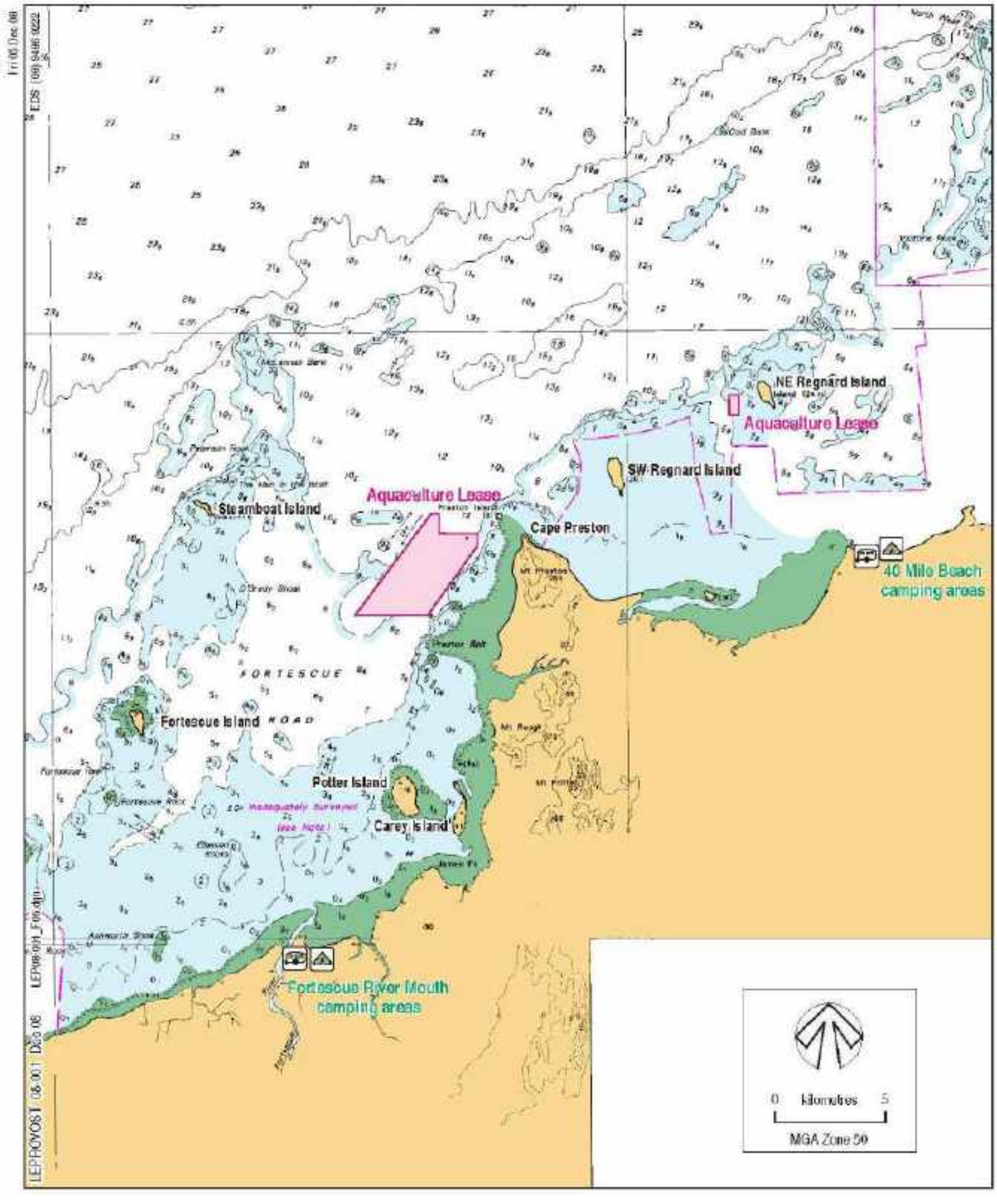

Figure 9 Camping areas and Aquaculture Leases in the vicinity of Cape Preston

4. PORT OPERATION

This section describes the port operational activities. Statement 635 states that the PEMP is '*to address emissions from the port berthing facility, product-handling facilities, desalination plant, and associated structures'*. A description of the operation of each of these facilities and has been detailed in the sections below.

4.1 PORT BERTHING FACILITY

A rail mounted non-slewing barge loader capable of loading at an average rate of 8,000 tph will operate on the breakwater. The fixed transverse boom of the barge loader conveyor is sized to cover the barge design width from the side of the loading berth (Figure 10).

A barge loading berth 340 m in length (Figure 11) will allow two barges to be berthed at once. The barge loader is designed to travel the full length of the berth. The barges are designed to each hold around 15,000 t of ore.

4.2 PRODUCT HANDLING FACILITIES

Product handling facilities that are to be managed by the PEMP include:

- Stockyard facility
- 4,000 t/hr rail-mounted rocker stackers
- 8,000 t/hr rail mounted bucket wheel reclaimer
- Stack and reclaim conveyors
- Product conveyors between the stockyard and loading facilities
- Wharf conveyor
- Transhipment Facility

4.2.1 Stockyard

A 1,200 m conveyor system will transfer pellets and concentrate to stackers which will stockpile the product in the stockyard (Figure 12). A stockpile capacity of approximately 3.0 Mt of concentrate and/or pellets will be available.

Ore will be stored in eight individual piles (four concentrate piles and four pellet piles). Concentrate piles will measure approximately 230 m x 52 m, with a height of 15 m. Pellets piles will measure approximately 140 m x 52 m, with a height of 11 m. The difference in height is due to the required angle of repose between the two products.

The stockyard will contain two sections, the concentrate stockpiles and the pellet stockpiles, which will be located alongside each other. The concentrate stockpiles will cover a total area approximately 1,000 m in length and 160 m in width, and the pellet stockpiles will cover a total area approximately 680 m in length and 160 m in width, which includes the spacing between each of the stockpiles (conveyors, reclaimers etc). The total footprint of these two areas is therefore approximately 25 ha.

Product will be deposited on the stockpile using 4,000 t/h rail mounted rocker stackers that can be used for concentrate or pellets. Product will then be transferred by an 8,000 t/h rail mounted bucket wheel reclaimer onto a conveyor.

4.2.2 Conveyors

The concentrate or pellet product will be transported via a 1,500 m conveyor (nominal operating rate of 8,000 t/h) which will run from the stockyard to a conveyor transfer point. Product will then be transferred onto a second 2,500 m conveyor which will run to the breakwater situated at the port. From this point a 450 m wharf conveyor will extend along the breakwater to the barge loading facility. The belts will be approximately 2 m wide and will be tensioned by counterweight.

The conveyors will be fitted with devices to measure the weight of material being transferred, as well as automatic detection devices to raise an alarm for situations such as belt misalignment, slippage and hopper blockage, and will also include safety pull-cord emergency stop switches.

The conveyors will be fitted with primary and secondary scrapers which will be used to clean the belt, and return belt 'V' ploughs will also be used where needed.

4.2.3 Transshipment Facility

The transshipment method involves the loading of barges at the port, which are then towed to the transshipment facility, located offshore in deep water. The transshipment facility then transfers the product from the barge to an OGV.

This method was chosen for Stage 1 of port operations as it defers the requirement to dredge a shipping channel, as the cost of dredging is not viable for the volume of product proposed to be exported for the first stage of the Project under Statement 635.

The transshipment facility is situated on a large self-propelled barge that supports two small barge unloading cranes, two hoppers, a covered conveyor system and a large ship loader (Figure 13). Such facilities are in operation in other parts of the world (Figure 14), and this facility will be capable of an average loading rate of 75,000 t/d.

OGVs will be anchored about 20 km offshore from Cape Preston within the area that will also be used for anchoring OGVs for the deep water port when the trestle structure is complete (Stage 2 of port development). The facility will be moored to the OGV and will be able to re-position itself, as required for the loading operation, anywhere along the length of the ship. An ore-carrying barge will be tied up to the other side of the facility.

The transfer of the ore from the barge to the OGV will be carried out by the transshipment facility which is equipped with two cranes with purpose built hydraulic grabs. The cranes will have a safe working load of 26 t at their maximum reach. The grabs will pick up the product and load it into a screened hopper chute, which will feed a covered conveyor that runs to the large ship loading arm. The ship loading arm will transfer the product via a flexible chute into the hold of the ship. The bottom end of the chute will extend below the hold opening to provide protection from the wind. It is estimated that it will take around four hours for the facility to transfer product from a barge to the OGV.

The grab will be specifically designed to capture and hold both concentrate and pellets, and it has a strong sealing capability to prevent product falling from the grab as it moves over the barge to the facility's hopper. Earthmoving equipment will be lifted onto the barge during the grabbing operation to push the product to a suitable depth to enable the grab to work efficiently, and to clean up the deck ready for the return trip to the port.

In the event of unsafe weather conditions the operation of the transshipment facility will be stopped, and it will cast off from the ship and anchor independently until weather conditions return within operational weather criteria. Also, in the event of imminent cyclonic activity or extreme high wind forecasts, the facility will cease operations and will be transferred to designated safe cyclone moorings until the weather reverts to operational conditions.

Operational weather criteria is as follows:

- Wind speed less than 20 knots
- Significant wave height less than 2.5 m
- Swell of less than 2.5 m
- Current less than 1.5 knots

The transshipment facility has been designed to minimise product loss for both economic and environmental reasons (refer to Section 5.1.3 for more detail). A similar facility is currently in operation in Spencer Gulf off Whyalla, and in the Gulf of Carpentaria in Queensland.

4.3 DESALINATION PLANT

The desalination plant is located to the east of the causeway and is sized to produce 44 GL/yr of desalinated water. The resultant brine is to be discharged from a diffuser with extends 60 m from the central area of the breakwater. Conditions relating to the construction and operation of the desalination plant are outlined in Statement 822, which replaced Condition 7-1 5 (Marine Management Plan) and 8-1 to 8-4 (Marine Wastewater Outfall) of Statement 635.

The desalination plant operations have no bearing on the port operations other than being considered in defining the boundary and limits of the Environmental Quality Objectives (EQO’s) and Environmental Quality Criteria (EQC’s) respectively.

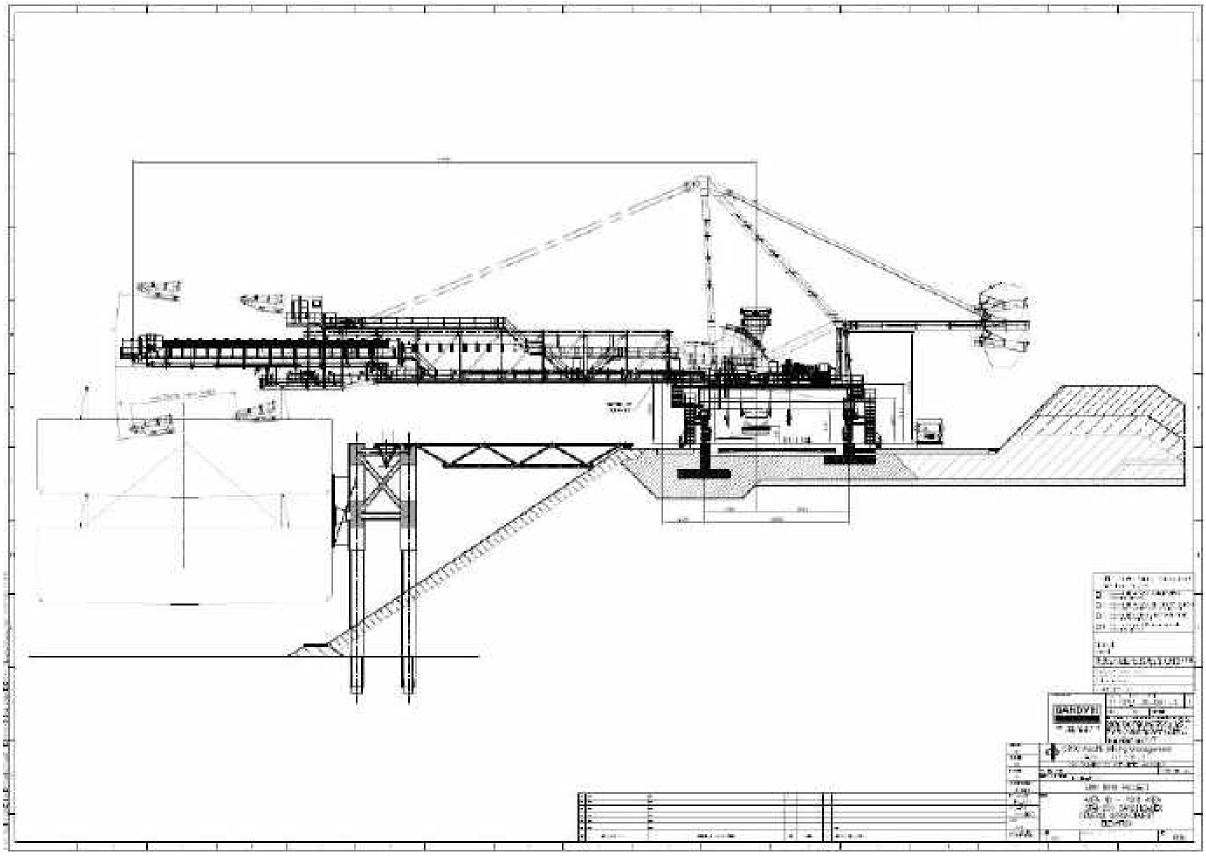

Figure 10 Side View of Barge Loader

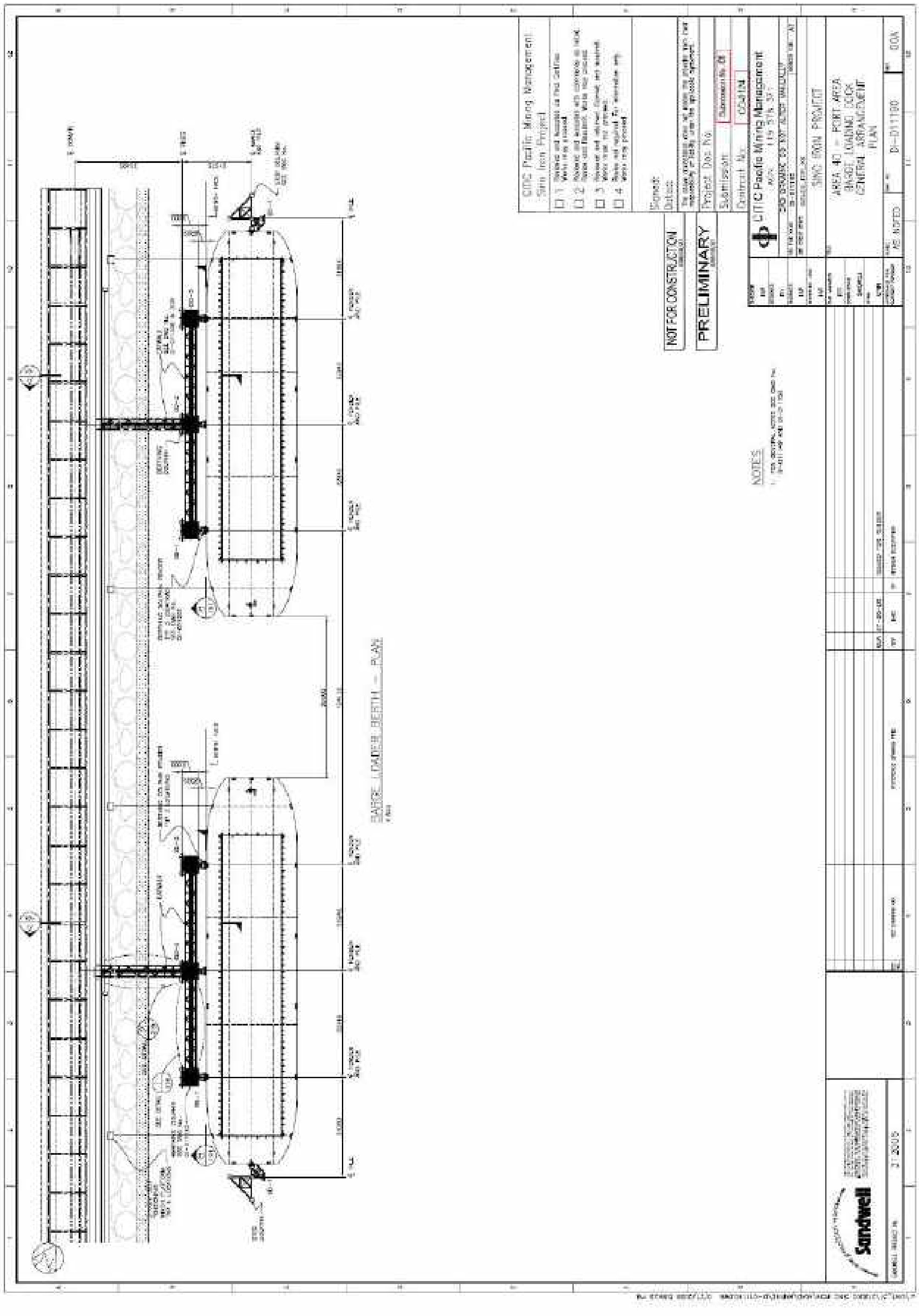

Figure 11 Barge Loading Berth Plan

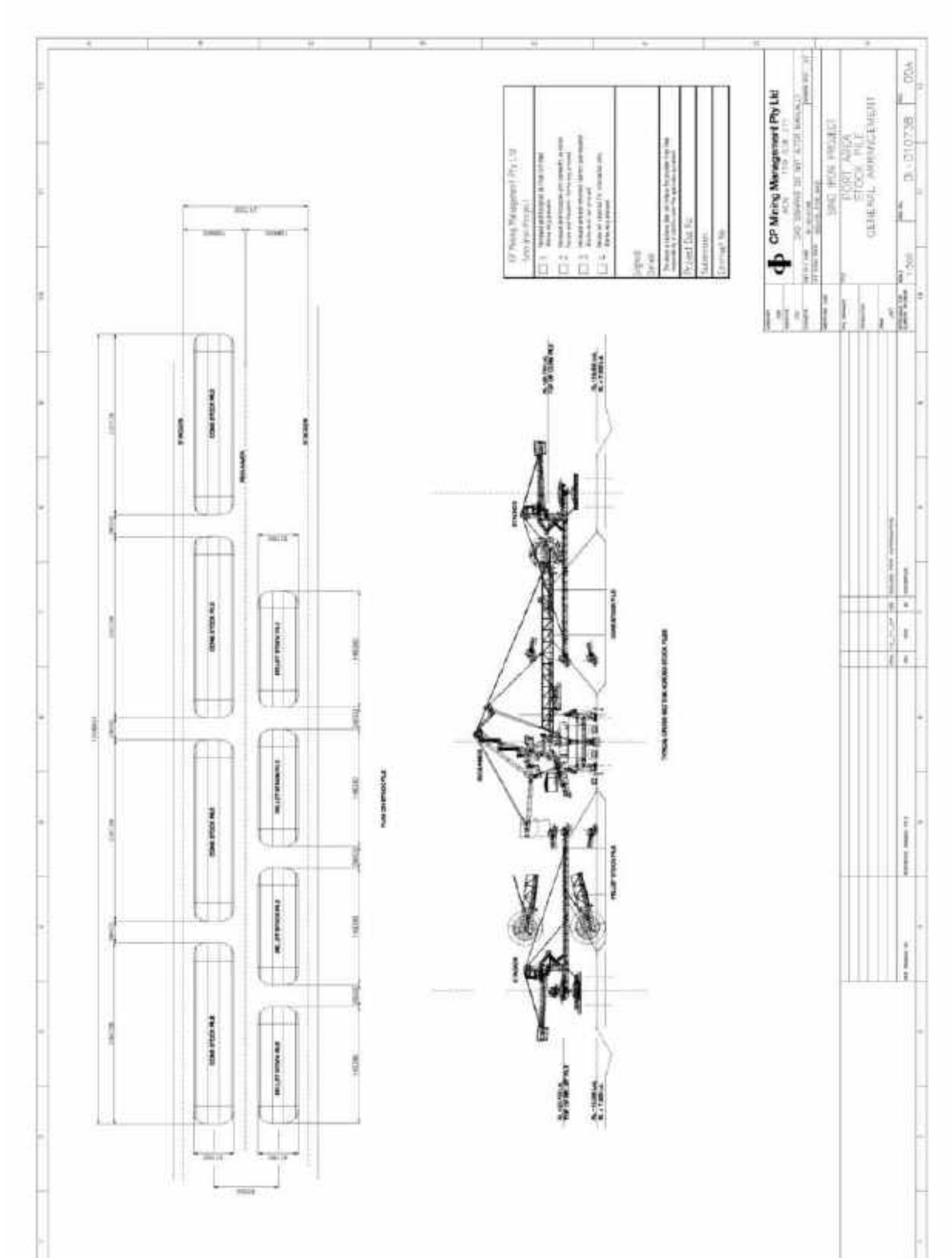

Figure 12 Stockyard Layout and Cross Section

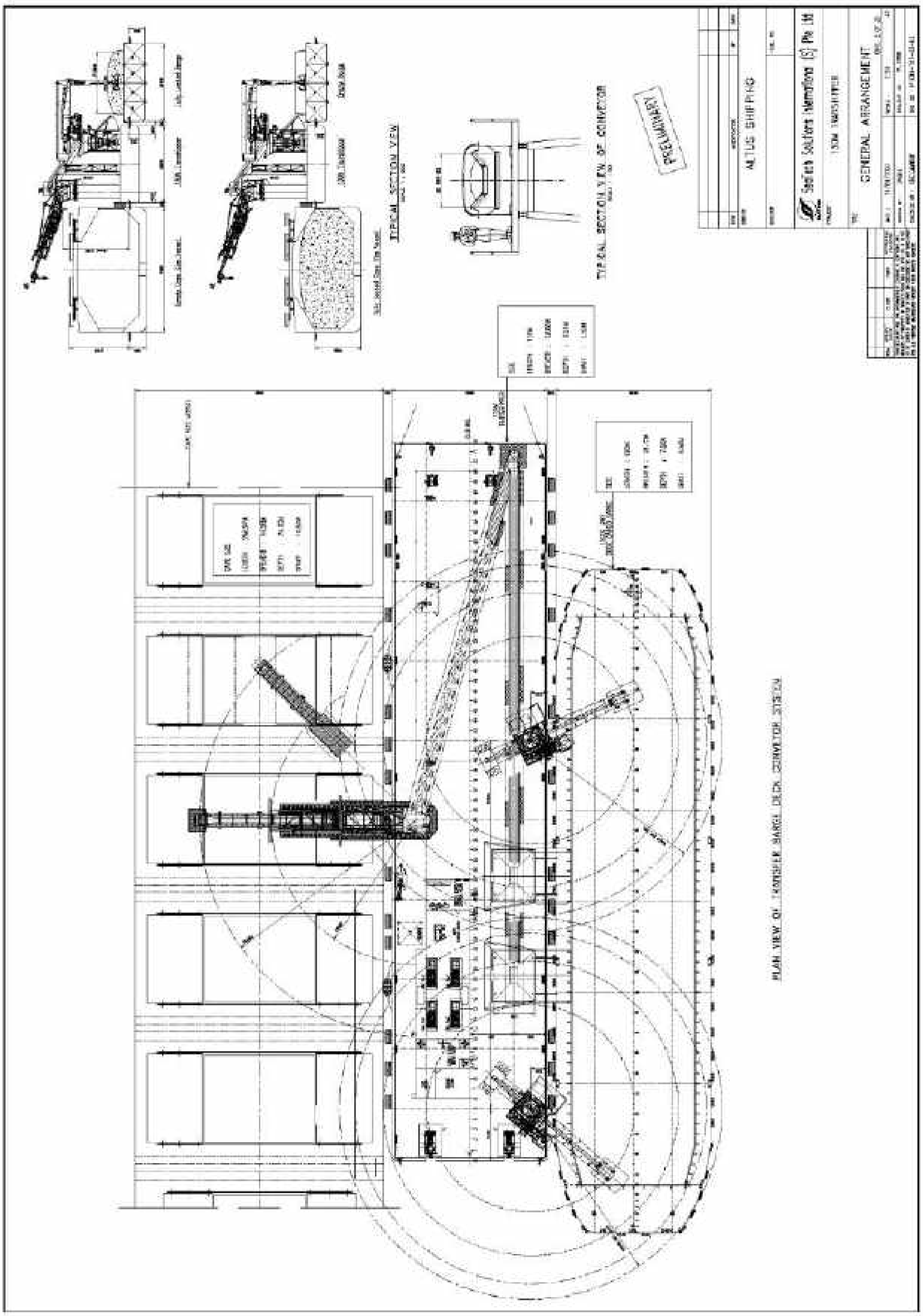

Figure 13 Layout of Transshipment Facility

Figure 14 Example of a Typical Transshipment Facility

5. PORT OPERATIONAL IMPACTS AND MANAGEMENT

5.1 TURTLES

The requirement of Statement 635, Condition 9-1Item 2 pertaining to the monitoring and management of turtles has been addressed by Section 2.2 of the Fauna Management Plan. This plan was approved by the EPA on 25 March 2009 with implementation commenced.

5.2 LIGHT SPILL

Condition 9-1 Item 2 of Statement 635 states that the PEMP shall '*ensure that light spill is contained to minimise impacts on turtles*'. The Cape Preston beaches were surveyed for turtle nesting activity by CALM in December 2000 and 2004 (CALM, 2000; 2005), Maunsell Australia in December 2002 and January -February 2003 (Maunsell, 2004), DEC in December 2006 (DEC, 2006) and Pendoley in January and March 2009 (Pendoley Environmental, 2009) and in October/November 2009, January, March and June 2010 (Pendoley Environmental, 2010). The results of the 2009/2010 survey provided further evidence that the beaches surrounding Cape Preston supports a very low density nesting and that nesting appears to be limited to flatback, green and hawksbill turtles (Pendoley Environmental, 2010). Analysis of turtle tracks and eggshells indicate that the green turtle, hawksbill turtle, flatback turtle and loggerhead turtle are accessing, or potentially accessing the Cape Preston beaches (Maunsell, 2004; DEC, 2006) in numbers that are not nationally or regionally significant.

The primary document for the management of light emissions, including design and operational methods, is the approved Fauna Management Plan (FMP), attached as part of Appendix 3. Turtle monitoring under the FMP increases knowledge of turtle usage at the Cape Preston beaches, and enables management actions to be refined as required over time based on the monitoring results.

A summary of the lighting commitments made in the FMP are included in Table 8 below. These are provided for reference only as the FMP has been approved.

Table 8 Management of light spill

Action	Timing	Responsibility
Install lighting which is: • Shielded/redirected/lowered/recessed to avoid/minimise light spill towards the southern and eastern beaches • of low disruptive colour (yellow and red)/long wavelength (e.g. low-pressure sodium vapour lights, or yellow filters/bug lights for larger areas/roads, or red LED lights for paths) and, if practicable and safe, develop a procedure for minimal light use during February to April. Buildings will use low reflectivity paints.	Design phase and ongoing	Project Manager, Manager Environment
Conduct post-construction assessment of light spill and effectiveness particularly during nesting season and hatching periods, for turtle response to lighting.	Ongoing	Environmental Superintendant/ Advisor (ES/A)

5.3 RUNOFF AND SPILLS

Condition 9-1 Item 3 of Statement 635 states that the PEMP shall '*ensure that runoff and spills are contained*'. 'Runoff and spills' has therefore been identified as sediment runoff and hydrocarbon spills in the coastal terrestrial environment. It was noted that one potential source of sediment that may be collected by surface water flows is product loss and dust from stockpile areas and product handling facilities.

‘Runoff and spills’ will therefore include:

- Product spills from stockpiles, handling facilities and loading facilities that could contribute to sediment loads in stormwater runoff
- Stormwater runoff from port terrestrial facilities
- Hydrocarbon spills from port terrestrial facilities, and spills on the breakwater and causeway

5.3.1 Product Spills

The major sources of product spills from the port area are expected to be stockpiles, transfer points or handling facilities. Management methods are therefore required to minimise product spills to prevent excessive sediment loading in stormwater.

Product spills are expected to consist of both concentrate and dust fragments that have broken off the pellets. In order to minimise these spills, various design and operational methods will be implemented (Table 9).

Table 9 Management of product spills

Action	Timing	Responsibility
The ore will be loaded onto the barge using a barge loader boom. The boom contains an enclosed headbox (with a dust curtain at the entrance), which is fitted with a rubber skirt. The boom will be raised or lowered so that the rubber skirt is just above the deposited ore. These design characteristics will be implemented to minimise wind effects, and to reduce the fall distance of the ore. Therefore expected product spills are expected to be minimal.	Design phase, then ongoing	Project Manager, Port Manager
All transfer conveyors will be enclosed along their entire length, with the exception of limited areas where a covered conveyor would interfere with the operation of transfer equipment such as reclaimers, stackers and loaders	Design phase	Project Manager
The conveyor system in the stockyard will be covered at areas of high product loss potential (transfer points etc)	Design phase	Project Manager
Conveyors will be fitted with primary and secondary scrapers which will be used to clean the belt	Design phase	Project Manager
Return belt ‘V’ ploughs will also be used to clean the conveyor belt where needed	Design phase	Project Manager
The transshipment facility will be fitted with enclosed conveyor systems and anti-spill boards, which ensure that product is never loaded or swung over the sea (always over the vessels).	Design phase	Project Manager
The transshipment loading boom has a flexible and luffing loading chute which will be used to reduce the fall distance of the ore and shroud the product from wind effects as much as possible	Ongoing	Port Manager
Spillages of product will be cleaned up as soon as practicable	As required	Port Manager

5.3.2 Stormwater Runoff

Stormwater that contains excess sediment is not expected to be toxic to marine organisms (low concentrations of product are not toxic in the marine environment); however it may lead to reduced light attenuation in the water column. This reduces the amount of light available for marine organisms, such as coral or macroalgae.

Stormwater runoff within the port facilities will therefore need to be contained, or only released when it can be confirmed that it is clear of sediment or hydrocarbons.

All areas within the port location (terrestrial or causeway/breakwater) have therefore been designed to ensure that stormwater is contained and not discharged to marine waters. The different areas of the port will drain to a specified collection point where it will be stored until it is used as process water or it evaporates. It is expected that stormwater runoff will not contain contaminated material as there will be minimal sources of contaminants at the port. If contamination is evident the stormwater collected will be sent to a licensed wastewater treatment plant (WWTP) or liquid waste facility, depending on the level of contamination.

The stockyard area has been designed with a 1% slope which will drain surface water towards collection V-drains, and these drains will direct stormwater to two main settlement ponds to the north of the stockyard. These ponds are planned to have a combined capacity of 60,000 m^3, and this capacity volume will be maintained by periodic clean-out by a front end loader. During the periodic clean-out, sludge will be removed from the ponds and disposed off at a licensed landfill. The stormwater runoff and water removed in the periodic clean-out process will be used as process water as it is not expected to be contaminated. If contamination is evident, the stormwater will be sent to a licensed WWTP or liquid waste facility, depending on the level of contamination.

All wharf decks, roadways and parking areas will be contained to ensure minimal direct discharge of spills to the sea, and drainage areas will be fitted with containment sumps/interceptors to trap product spills. In the event of cyclonic rainfall or storm driven waves swamping the wharf decks, the sumps will be closed off to prevent the overflow of contained contaminants from wharf sumps.

5.3.3 Hydrocarbon Spills

Hydrocarbon spills can result from incorrect storage, refuelling spills, accidents and faulty fuel lines or hoses on vehicles and refuelling areas. These spills have the potential to flow into the marine environment if appropriate management measures are not implemented. Hydrocarbons can impact the marine environment by either direct contact (toxic nature of hydrocarbons) or by reducing oxygen transfer from the air, resulting in lower dissolved oxygen levels in the water column. The likelihood of spills entering the marine environment, and the resultant impact, will therefore need to be minimised using a combination of site containment techniques, adequate maintenance schedules, and sufficient containment and clean up equipment. A detailed list of hydrocarbon spill management is contained below in Table 10.

Sources of hydrocarbon spills could include:

- Wharf decks, roadways and parking areas:
  - hydrocarbons from vehicle refuelling or engine and transmission drips
  - spills caused during loading/unloading operations
- Fuel storage areas and associated pipelines and fittings
  - transfer leaks during refuelling
  - leaks from storage tanks, pipes or valves
  - rupture of tanks or pipes
  - overflow of storage tanks or bunds
- Lay down and maintenance areas
  - general leaks from vehicles

Table 10 Management measures proposed to ensure hydrocarbon spills are contained

Action	Timing	Responsibility
Ensure hydrocarbon containment facilities contain an impermeable bund that is capable of holding at least 25% of the total volume to be contained within it, or 110% of the largest container, whatever is the largest	Design phase, ongoing	Project Manager
Confirm the adequacy of spill management measures against legislative requirements and guidelines	Prior to operation, then every six months	Project Manager, Port Manager

Action	Timing	Responsibility
Confirm that adequate procedures are in place so that any hydrocarbon spill or incident will be responded to quickly and effectively	Prior to operation, then every 12 months	Port Manager
Review vehicle re-fuelling procedures to ensure that they are appropriate for protection of the marine environment and in accordance with legislative requirements and guidelines	Prior to operation, then every 12 months	Manager Environment
Perform inspections of fuel hoses, connections, bunds, sumps and hydrocarbon storage areas	Every two months	Port Manager
Perform regular inspections to determine the adequacy of oil spill response equipment, and replenish supplies as required	Every two months	Port Manager
The following equipment will be available in the event of a spill: • sorbent boom • sorbent mats • vessel suitable for monitoring the slick and deploying sorbent materials	Ongoing	Port Manager
Refuel all trucks and light vehicles at a bunded facility onshore at Cape Preston	Ongoing	Port Manager
If refuelling of heavy vehicles is required while they are in use on the causeway or breakwater, only refuel them using a dedicated service vehicle equipped with suitable spill control equipment	Ongoing	Port Manager
Prevent spills from being discharged to the marine environment by responding immediately in accordance with procedures	Ongoing	Port Manager
Fit all fuel storage tanks (mobile or fixed) with a screw fitting connection or other similar connection	Ongoing	Project Manager
Equip all fuel storage tanks (mobile or fixed) with an auto shut-off valve or other appropriate device to prevent overfilling	Ongoing	Project Manager
Prepare and maintain a Hazardous Materials Register, standard and procedures for all hazardous materials kept at the port. Include in the Register descriptions of materials and their uses, handling procedures, storage regulations and standards, quantities stored onsite and Material Safety Data Sheets (MSDSs) for all materials. Locate the Register onsite and make it accessible to all personnel.	Ongoing	Port Manager
Ensure work shop areas incorporate closed drainage systems routed through oil-water separators	Ongoing	Project Manager
Include in inductions for all port personnel information on: ▪ procedures for handling and storage of fuels and chemicals ▪ transferring of fuel and the refuelling of vehicles and machinery ▪ vehicle maintenance ▪ spill response ▪ use and location of the Hazardous Materials Register.	Ongoing	Port Manager
Comply with the relevant legislation, regulations and Australian Standards for the storage and handling of fuels and chemicals: Explosives and Dangerous Goods Act 1961. Explosive and Dangerous Goods (Explosives) Regulations 1963. Explosive and Dangerous Goods (Dangerous Goods Handling and storage) Regulations 1992. Dangerous Goods (Transport Road & Rail) Regulations 1999. AS 1940 - The storage and handling of flammable and combustible liquids. AS 3780 - The Storage and Handling of Corrosive Substances. AS 4452 - The Storage and Handling of Toxic Substances. AS 4681 - The Storage and Handling of Class 9 miscellaneous) Dangerous Goods and Articles.	Ongoing	Project Manager, Port Manager
Use self-bunded storage vessels and pallets wherever practicable.	Ongoing	Port Manager
All storage vessels shall be tested and labelled as required by legislation.	Ongoing	Port Manager
Protect fuel and chemical storage tanks from accidental dislodgement by plant vehicles or natural causes.	Ongoing	Project Manager
Ensure that spill response materials are available at defined locations and that personnel are informed of these locations and instructed in their use.	Ongoing, with personnel checks every two months	Port Manager

Action	Timing	Responsibility
Drain accumulated water from containment facilities whenever present. Collect by a licensed operator water that is visibly contaminated or suspected to be contaminated for treatment through an oil-water separator or disposal at a WWTP or liquid waste facility licensed to accept the waste.	As required following rainfall events	Port Manager

5.4 MARINE HYDROCARBON SPILLS

Condition 9-1 Item 4 of Statement 635 states that the PEMP shall '*incorporate an OSCP*' to minimise the potential impacts to the marine environment as a result of a hydrocarbon spill. The OSCP is included as part of this PEMP in Appendix 1, and the spill reporting procedure and a summary of the response measures proposed in the OSCP are listed in Figure 15 and Table 11 respectively to provide an overview.

As mentioned in Section 1.2.1, the OSCP incorporates all aspects of port operation (Stage 1 & 2) including operation of the trestle jetty. The OSCP will therefore not need to be updated at a later stage to incorporate Stage 2 activities.

The response priorities for all marine pollution emergencies are the protection of:

- Human safety
- Habitat and cultural resources
- Rare and/or endangered flora and fauna
- Commercial resources
- Recreational and amenity areas

Environmental protection priorities will focus on the environmental protection of Preston Island and surrounding coral and ecological communities present within and in the vicinity of the port. These priorities will consider the likelihood of success of a response and overall ecological value of the various resources under threat. Net environmental benefit considerations will dictate response decisions, for example, in the use of chemical dispersants.

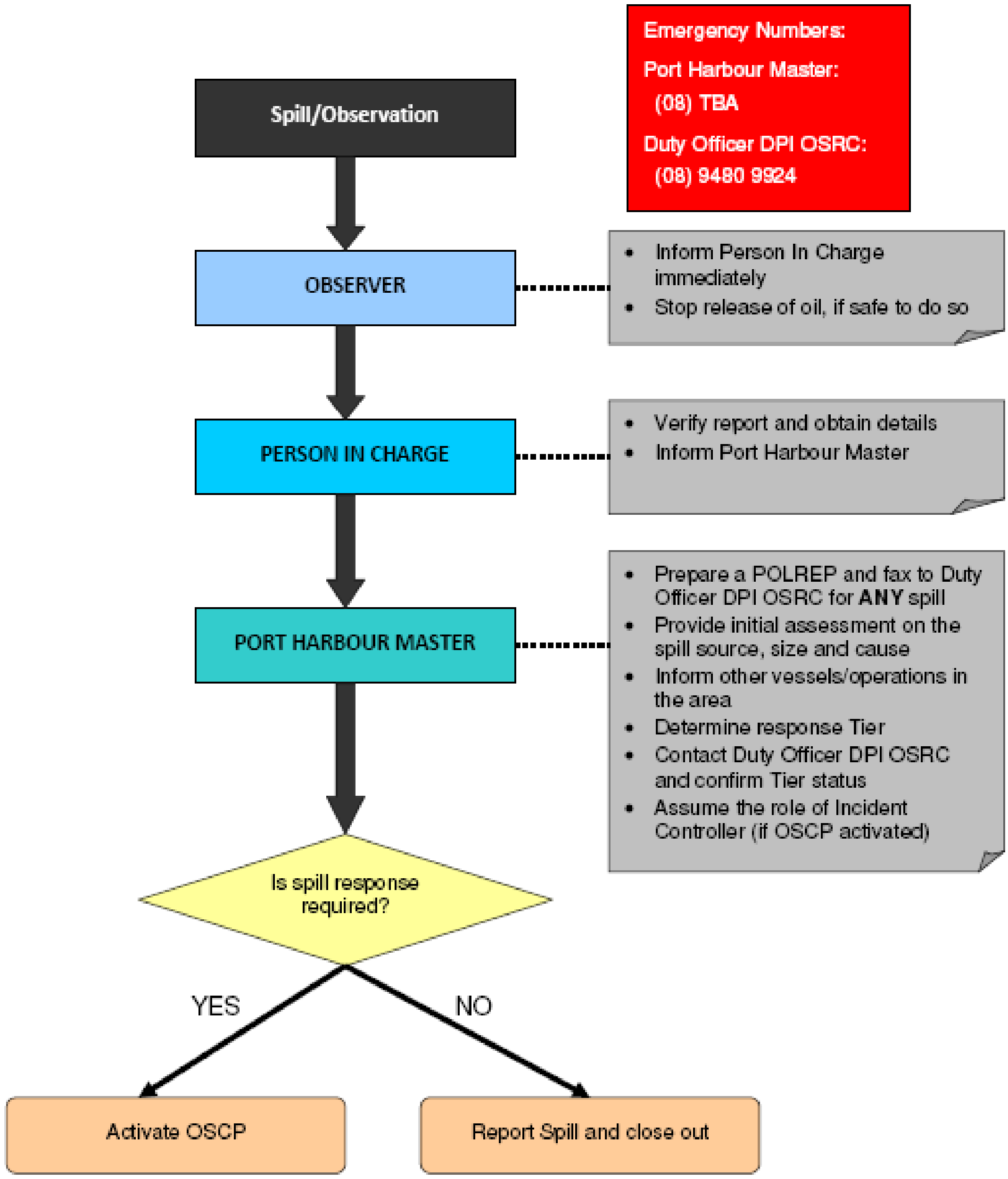

Figure 15 Spill reporting procedure

Table 11 Response decision table for typical hydrocarbon spills

		Oil Type		
		Diesel	Heavy Fuel Oil	Hydraulic or lubricating oils
Recommended Strategy	Monitor and Evaluate	YES ☑ See Section 3.4.1	YES ☑ See Section 3.4.1	YES ☑ See Section 3.4.1
	Physical Break-up	YES ☑ See Section 3.4.2	NO ☒ See Section 3.4.2	NO ☒ See Section 3.4.2
	Containment and Recovery	YES ☑ See Section 3.4.3	YES ☑ See Section 3.4.3	YES ☑ See Section 3.4.3
	Chemical Dispersant Application	NO ☒ See Section 3.4.4	YES ☑* See Section 3.4.4	NO ☒ See Section 3.4.4
	Shoreline Protection	YES ☑ See Section 3.4.5	YES ☑ See Section 3.4.5	YES ☑ See Section 3.4.5
	Shoreline Clean Up	YES ☑ See Section 3.4.6	YES ☑ See Section 3.4.6	YES ☑ See Section 3.4.6

*May have limited effectiveness. Ensure the dispersant has been approved for use and any necessary authorisation has been granted.

Please note section references listed in the table above refer to the OSCP.

Spill response equipment for Tier 1 response to be kept at Cape Preston is as follows:

- 300m of solid buoyancy booms
- 5 x 15 kg Anchor Kits
- 1 x Foilex skimmer
- 1 x Diesel powered spate diaphragm pump
- 2 x Collapsible oil recovery tank (10,000L)
- 1 x Work boat suitable for deploying equipment
- Various absorbent booms, pads and rolls
- Various PPE

5.5 BALLAST WATER AND BIOFOULING

Condition 9-1 Item 5 and 6 of Statement 635 states that the PEMP shall '*incorporate an Ballast Water Management Plan'*, and '*include a Hull Fouling Organisms Management Plan, which includes a risk assessment and a baseline marine survey for benthic and planktonic organisms in the areas designated for ship berthing to minimise the risk of introduction of exotic marine organisms from ships' hulls*'.

As mentioned in Section 1.2.1, the Ballast Water and Biofouling Management Plan (BW&BFMP) (Appendix 2) incorporates only Stage 1 aspects of port operation including the operation of the breakwater port and facilities. This document will therefore be updated at a later stage to incorporate Stage 2 activities.

A baseline invasive marine pests (IMP) survey was completed by URS in early 2009, based on the reduced risk of Stage 1 port activities (no OGV's docking at Cape Preston). Based on the findings of this survey the BW&BFMP was developed, with a summary of management commitments outlined below.

5.5.1 Ballast Water Procedure

All ships travelling in Australian territorial waters and/or visiting an Australian port are required to manage 'high risk' ballast water through one of the following approved options:

- Full ballast water exchange at sea. This exchange should take place as far as possible from the nearest land; however, as a minimum, it must take place outside the Australian 12 nm limit. The exchange must achieve at least 95 per cent volumetric exchange and should be undertaken in water at least 200 m deep. Where the empty/refill method is employed, all of the ballast water should be discharged until pump suction is lost. Stripping pumps or eductors must be used if possible, before refilling ballast tanks; or:
- Where the flow-through method is employed in the open ocean by pumping ballast water into the tank or hold and allowing the water to overflow, at least three times the tank volume must be pumped through the tank; or
- Tank to tank transfer. This may be employed where the vessel is able to move 'high risk' ballast water from tank to tank within the vessel to avoid discharging high risk ballast water in Australian ports or territorial waters; or
- Non-discharge of 'high risk' ballast water in Australian ports or territorial waters; or
- Alternative Ballast Water Management Methods. The use of an alternative method not specified above requires a written application be forwarded to the Australian Quarantine and Inspection Service (AQIS) before the event.
- Where ballast water exchange is not possible due to weather, sea conditions or operational impracticability, the master must report this fact as soon as possible prior to entering the port.
- Access to an on-board sampling point must be provided upon request, provided it is safe for the ship and crew. The location of suitable access points for sampling ballast or sediment will be described in the ship's operational manuals. This will allow crew members to provide maximum assistance when samples of the ballast water or sediment are required.

Sediment resulting from tank and/or hold cleaning must be disposed of in an AQIS approved manner on land. It is not to be released at sea within 12 nm of the coast.

5.5.2 Ballast Water Reporting

- Ships are required to complete the AQIS Ballast Water Reporting Form, which is part of and attached to the AQIS Quarantine Declaration for Vessels (Pratique). All details on the AQIS Ballast Water Reporting Form must be completed by international ships before visiting their first Australian port of call and must be sent to AQIS Quarantine Declaration for Vessels. The Quarantine Declaration must be completed and forwarded to the Port Manager no more than 24 hours and no less than 12 hours before a ship enters its first Australian port of call. These forms can be sent by fax or by telex.

- Ships not completing the report form will, on arrival in port, be required to complete the form with an AQIS officer present, without cost to the Port Manager.

5.5.3 Ballast Water Monitoring

- All ships must have a ballast water record book on board. To facilitate the administration of ballast water management procedures on board each ship, a responsible ship's officer shall be appointed to maintain appropriate records and to ensure that ballast water management procedures are followed and recorded.

- When taking on or discharging ballast water, the dates, geographical locations, depth of water, ship's tank(s) and cargo holds as well as the amount of ballast water loaded or discharged will be recorded on the report form.

- Compliance monitoring of the above strategy will be undertaken by AQIS by, for example, taking and analysing ballast water and sediment samples to test for the continued survival of harmful aquatic organisms and pathogens, and by verifying the accuracy of data provided on the report form.

- All shippers will be requested to provide evidence of their policy and procedures on ballast water management prior to the award of any shipping contracts.

- Regular IMP monitoring of the port, transhipment facility and surrounding areas will be undertaken. This is expanded upon in Section 7.

5.5.4 **Ballast Water Sampling**

If requested by AQIS ballast water and sediment samples will be collected for analysis. Sampling may also be on a random basis as a means of providing information on whether ballast water management procedures are effective. If abuse of de-ballasting approval is detected, appropriate action to minimise environmental impact will be taken and action against the Vessel Master and/or Owners will be considered by AQIS.

Sampling methods are detailed in the Project BW&HFMP in Appendix 2.

5.5.5 **Biofouling Management**

Most of the vessels in the operational phase of Stage 1 will be tugs and barges moving from Cape Preston to the offshore transshipment area. Offshore vessels will load at the offshore transshipment area for only a short period. These will typically be well maintained with up to date antifouling coatings; and will operate at relatively high speeds, which reduces the ability of organisms to maintain purchase on external surfaces. There may be some smaller overseas vessels moving directly to the Materials Offloading facility (MOF) and/or service wharf. The measures that will be taken to minimise biofouling during the Stage 1 operational phase are shown in Table 12 and within the Vessel Risk Assessment Scoring Sheet (VRASS) which is part of the BW&BFMP.

Table 12 Biofouling management measures during Stage 1 port operation

Activity	Action/Response	When	Instigator/s	Others
Cleaning of hull and propeller	Deny requests for in-water cleaning, and forward any request for cleaning in Dampier to the DPA	All times	Port Manager	DPA Ship Agents
Undertake risk assessment using form at Appendix A	Undertake marine pest risk assessment using the VRASS	Before arrival	Port Manager	
Cleaning of medium and high risk vessels	▪ Vessels determined to be of medium or high risk to be inspected by qualified and experienced marine scientist if recommended by DoF ▪ Fax or e-mail report to DoF (cc. to AQIS, DPA) ▪ Collect and retain samples for DoF ▪ Obtain scientific identification of the biofouling organisms ▪ Cooperate to identify remedial action/s and develop tailored action plan in consultation with DoF ▪ Re-inspect vessel, and instigate appropriate remedial actions that may be warranted on the basis of that inspection	Within 48 hours of arrival	Port Manager	DPA, DoF
Review and report on results of risk assessments	Inform ship agent, charterer, broker	After incident, and/or in annual environment reporting	Port Manager	AQIS, Ship Charterers, Ship Agents

6. MONITORING PROGRAM

This section provides a description of the monitoring program to evaluate performance in meeting the requirements of Condition 9-1 Item 1 of Statement 635.

6.1 ENVIRONMENTAL VALUES TO BE PROTECTED AT CAPE PRESTON

Item 1 of Condition 9-1 identified that the ecosystem health, fishing and aquaculture, and recreation and aesthetics ecological values (EV's) were applicable to the proposal. The EQO's to maintain these EV's are detailed below.

6.1.1 EQO 1 - Maintenance of Ecosystem Integrity

EQO 1 is aimed at maintaining ecosystem integrity and biodiversity, to ensure the continued health and productivity of coastal ecosystems. Four levels of protection have been defined for EQO 1 (Table 2), which generally describe the limit of acceptable change from natural conditions (EPA 2000).

It is expected that the operating areas of the port will be provided a moderate level of ecological protection, which is consistent with that provided to other operational ports in the Pilbara. The location of the Moderate Ecological Protection Area (MEPA) is proposed to be an area 250 m in width surrounding the operating port area, shown in Figure 16. A high level of ecological protection will be maintained at the edge of the MEPA.

6.1.2 EQO 2 - Maintenance of Aquaculture and Aquatic Life for Human Consumption

EQO 2a & b are part of the fishing and aquaculture EV and are aimed at ensuring that aquaculture and aquatic life will be safe for human consumption (EPA 2000). EQO 2a & b will be protected in all areas apart from the Low Ecological Protection Area (LEPA) associated with the desalination brine outfall mixing zone (not relevant to this EMP).

6.1.3 EQO 3 & 4 - Maintenance of Contact and Aesthetic Values

EQO 3 & 4 are part of the recreation and aesthetics EV and are aimed at ensuring that water quality will be safe for human contact (primary and secondary), and aesthetic features are maintained. EQO 3 & 4 will be protected in all areas apart from the LEPA associated with the desalination brine outfall mixing zone (not relevant to this EMP).

6.2 SEDIMENT QUALITY MONITORING

Sediments are long-term indicators of the distribution and accumulation of contaminants, and generally change little, unless there is variable flux of pollutants, new pollution sources, spills, progressive removal of the contaminated layer, or sediment erosion or deposition. The objective of sediment surveys is to determine the spatial variability in the concentration of potential contaminants in sediments at sites in the vicinity of the port operations area. Sediments are not expected to be impacted at the transshipment facility as it will move location frequently to dock with OGVs. It is therefore proposed to not perform sediment sampling at this location.

Sampling for the presence / absence of sediments *in situ*, focuses on the depositional surface (0-2 cm) layer of sediments, as requested by EPA[1] (ANZECC/ARMCANZ 2000b; EPA 2005b), and protocols for sediment corers, depth of sampling and collection of replicate samples are provided in EPA (2005b).

6.2.1 **Sampling Scheme**

The sediments at the indicative sites shown in Figure 16 will be monitored for accumulation of contaminants. The sites have been placed either in regions of potentially polluting activities to assess 'worst case' conditions or on the Moderate/High ecological protection boundary to help demonstrate that the activities of the Port are not extending outside the proposed MEPA. The monitoring program described here is targeted solely at sediment monitoring related to port operations.

The sediment sampling methodology recommended is that provided in the Cockburn Sound SOP Manual (EPA 2005b), which recommends the following:

- At each site, five replicate surface sediment samples will be collected. A composite sediment sample is obtained from five sub-samples taken from the corner points and centre of a 1 x 1 m quadrat
- The top (i.e. 0-2cm) of each of the five cores is then scraped into a single container and stored on ice for subsequent analysis
- Five replicate samples will be taken at each site, but only three samples from each site analysed initially, in accordance with the minimum recommended replicates for analysis

Sediment samples will be kept on ice and then kept frozen prior to analysis, which will be undertaken by a NATA-accredited laboratory. Sample analysis will report against the lowest practical analytical limits from a NATA commercial laboratory, and where possible analytical limits will achieve the sediment quality guidelines (Table 13). Where concentrations are reported as less than this limit, the limits of reporting will be used in the calculations.

6.2.2 **Quality Control Measures**

Quality control measures for sediment sampling reporting requires that:

- Sampling dates are included
- GPS site coordinates be included
- Equipment cleaning procedures between sites should be briefly described
- It should be confirmed whether analyses were undertaken by laboratories within the prescribed holding periods for analytes
- Laboratory data reports (as well as QA reports) should be included as an appendix in final reports

[1] Correspondence dated 3 October 2011 from the EPA to Mineralogy requested that the sampling of the 2 -5 cm core layer be replaced with the surface layer 0 -2cm. This changes the purpose of monitoring from assessing potential effects on the layer inhabited by biota to a simple presence / absence of sediments accumulating on the surface.

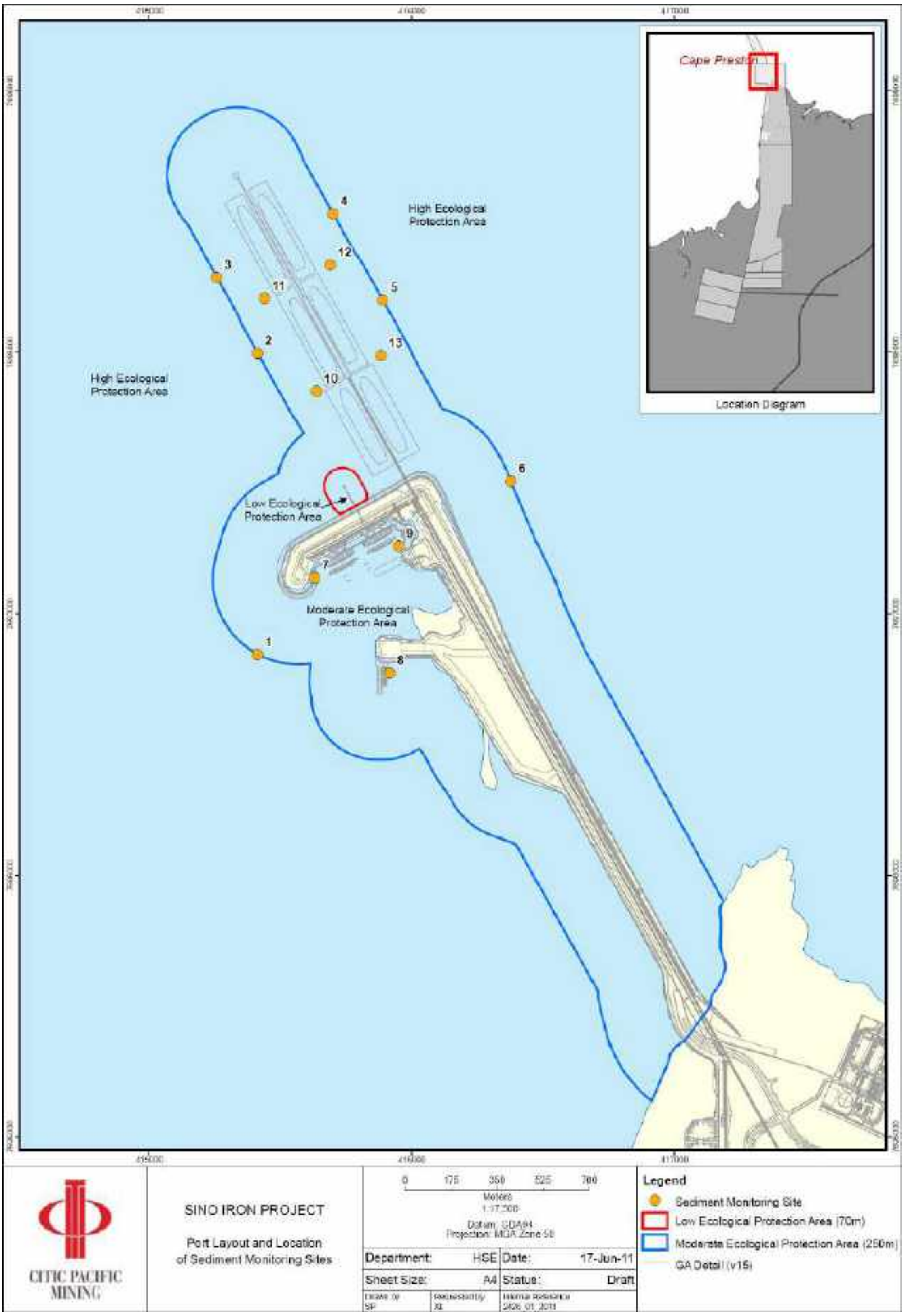

Figure 16 MEPA and Indicative Monitoring Sites

6.2.1 Sampling Frequency

The National Guidelines for Disposal of Dredged Material (Commonwealth of Australia 2009) indicate that where the sediment quality has been found to be relatively consistent over time, and there are no new pollution sources, sampling every 3-5 years may be sufficient. For this reason, sampling is proposed to be carried out prior to the commencement of port operations, 1 year after the commencement of operations and then (subject to there not being any exceedence of trigger levels) at an interval every 5 years after this time. This frequency is considered sufficient to assess sediment quality, unless there is any major change in port operations, or an incident (e.g. spillage) that might affect sediment contaminant levels.

6.2.2 Laboratory Analyses

Sediment samples will be analysed for the parameters tabulated in Table 13, which includes:

- Particle-size analysis
- Organic matter and carbonate content
- Metals
- Organics

Table 13 Analytes, criteria and reporting limits for sediments

Parameter	EQG value[1] (ISQG-Low)	EQG re-sampling trigger[1] (ISQG-High)	Reporting Limit
Metals and Metalloids (mg/kg dry wt)			
Arsenic	20	70	0.5
Cadmium	1.5	10	0.1
Chromium	80	370	1.0
Copper	65	270	0.2
Lead	50	220	1.0
Mercury[2]	0.15	1	0.01
Nickel	21	52	1.0
Silver	1	3.7	0.1
Zinc	200	410	0.5
Iron [4]	80^{th} percentile of background levels	95^{th} percentile of background levels	100
Organometallics (µg Sn/kg dry wt)			
Tributyltin	5	70	2.0
Organics (µg/kg dry wt)			
Acenaphthene	16	500	10-20
Acenaphthalene	44	640	10-20
Anthracene	85	1100	10-20
Fluorene	19	540	10-20
Naphthalene	160	2100	10-20
Phenanthrene	240	1500	10-20
Low molecular weight PAHs[3]	552	3160	10-20
Benzo(a)anthracene	261	1600	10-20
Benzo(a)pyrene	430	1600	10-20
Dibenzo(a,h)anthracene	63	260	10-20
Chrysene	384	2800	10-20
Fluoranthene	600	5100	10-20

Pyrene	665	2600	10-20
High molecular weight PAHs[3]	1700	9600	10-20
Total PAHs	4000	45000	10-20
Other			
Particle Size Analysis	Not applicable	Not applicable	N/A
TOC (mg/kg)	Not applicable	Not applicable	100

Notes [1] Guidelines taken from Cockburn Sound EQC document Table 3 (EPA 2005a)

[2] Low level analysis required to meet guidelines

[3] Low molecular weight PAHs are the sum of concentrations of acenaphthene, acenaphthalene, anthracene, fluorene, 2-methylnaphthalene, naphthalene and phenanthrene; high molecular weight PAHs are the sum of concentrations of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and pyrene.

[4] There are no ISGV for Iron in sediments within ANZECC or Cockburn Sound EQC document as it is not considered toxic. Inclusion of Iron was at the request of the OEPA 3rd October 2011. The National Assessment Guidelines for Dredging 2009 have been used as a standard used for Iron which recommends comparison against background concentration levels.

6.3 WATER QUALITY MONITORING

Water quality monitoring is of limited value in detecting the influence of contaminant inputs due to port activities, as it only provides a snapshot of water quality conditions on the day of sampling. As stated previously, a better long-term indicator of potential contaminant problems due to port activities is provided by monitoring contaminant levels in sediments, where they typically accumulate.

The potential sources of contaminants that could affect water quality around the port are limited. Contaminants (metals and organics) are possible sources of contamination (refer section 6.2) which are best traced in sediments. Nutrients and faecal bacterial contamination are not a potential source of contamination as there is no direct pathway from port-related operational activities. The altered mixing environment (breakwater, causeway) will be the main cause of any water quality changes brought about by the port. In addition, the movement of vessels may result in localised increases in turbidity and there may also be localised impacts due to human activities and ship operations at berth.

Based on the above water quality monitoring will occur in accordance with Statement 822 and shall ensure that within the LEPA the 95th percentile of bioaccumulating toxicant concentrations meets ANZECC and ARMCANZ 2000 National Water Quality Management Strategy 80% species protection guideline levels, and within the MEPA the 95th percentile of toxicants meets ANZECC and ARMCANZ 2000 National Water Quality Management Strategy 90% species protection levels.

6.3.1 Aesthetic Water Quality

Aesthetic water quality surveys will be undertaken at the same time as the sediment monitoring. A series of visual aesthetic assessments of water quality will be made at each site. The presence or absence of the parameters listed in Table 14 will be recorded.

Table 14 Aesthetic Water Quality Indicators

Site: Date: Observers initials:		Comments
Nuisance organisms (algal/plant material) present in excessive amounts?	Yes/No	
Large-scale deaths of marine organisms visible?	Yes/No	
Natural visual clarity of the water not reduced by more than 20%?	Yes/No	
Noticeable colour variation?	Yes/No	
Natural reflectance of water not changed by more than 50%	Yes/No	
Oil or other films noticeable as a visible on water surface?	Yes/No	
Floating debris or dust visible on the surface?	Yes/No	
Detectable objectionable odour associated with water?	Yes/No	

6.4 CORAL HEALTH MONITORING

Coral health monitoring, involving the long-term monitoring of coral habitats in the vicinity of the Port on an annual basis are detailed in the MMP (LeProvost 2008a; Appendix 3). A summary of coral monitoring proposed during port operations is listed in Table 15 below.

Table 15 Monitoring of coral habitats during port operation

Location	Timing	Parameter(s)	Procedure	Purpose	Responsibility
Refer Figure 17	Monitor during May - June each year and deliver report to DEC within 3 months of survey completion	Coral health and abundance	Monitor coral cover and species diversity at all sites on an annual basis and report findings to DEC	To validate the scale of coral habitat loss predicted to occur over the long term from port presence	Environmental Manager
Refer Figure 17	On an opportunistic basis after cyclones and report in annual report to DEC	Coral health and abundance	Monitor coral cover and species diversity at all sites after passage of severe cyclone	To record the scale of coral habitat loss after the passage of severe cyclones	Environmental Manager
Refer Figure 17	Six months after completion of fifth annual coral habitat survey	Coral health and abundance	Review success of achieving objectives and targets after five years and report to DEC	To validate the scale of coral habitat loss predicted to occur over the long term from port presence	Environmental Manager

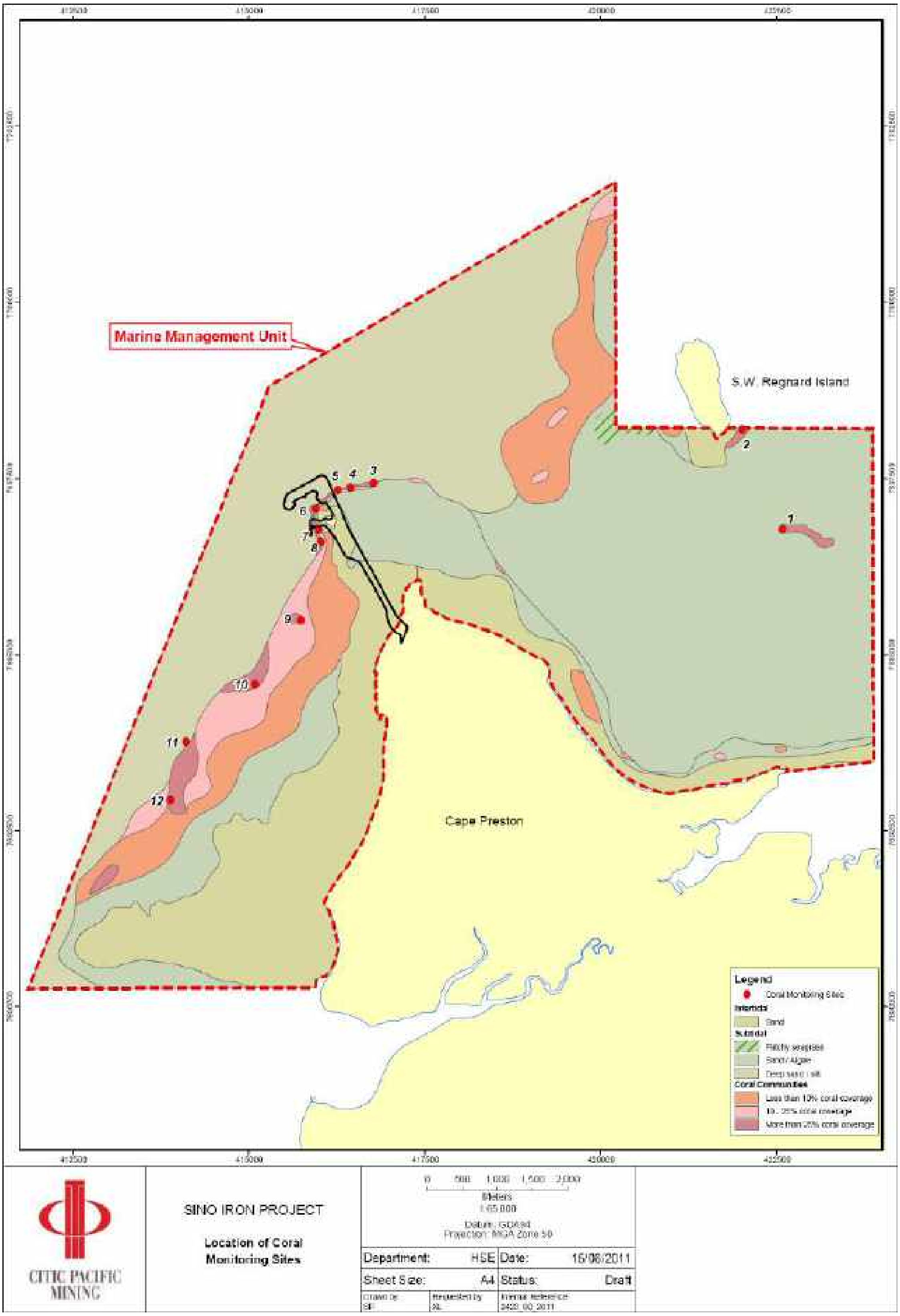

Figure 17 **Location of coral monitoring sites**

7. MANAGEMENT TRIGGERS AND CONTINGENCIES

7.1 SEDIMENT QUALITY TRIGGERS & CONTINGENCIES

The median sediment total contaminant concentration (analysed using a strong acid extraction) from a defined sampling area should not exceed the Environmental Quality Guideline (EQG) value (ISQG-Low) for high and moderate ecological protection areas. The total contaminant concentration at any individual sample site should not exceed the EQG re-sampling trigger (ISQG-High) (Table 13). If an exceedence is found the sediment will be re-sampled within one month of initial results having been received.

If the total concentration trigger values for metals are still exceeded, this will trigger further investigation, which may include the analysis of bioavailable metals (analysed by dilute acid extraction) (Figure 18). EPA (2005a) states that bioavailability analysis can be used to obtain a better indication of levels of potentially bioavailable metals but does not specify that bioavailability analysis should occur in initial samples.

If subsequent monitoring shows that the risk remains unacceptable (i.e. EPA objectives will not be met), remedial actions will be developed in consultation with DEC. These may include:

- Modifying port operation processes, such as tighter controls on vessel loading or refuelling operations to ensure that pathways for contaminants into the marine environment are appropriately managed
- Close monitoring of activities which could result in further inputs to the marine environment (for example spillage of fuel during refuelling)
- Investigating the source of contamination, and resurvey sediments within a three month timeframe to reconfirm level of contamination
- Consulting with DEC regarding appropriate further remedial actions

The management response framework in the event of an exceedence of guideline sediment quality trigger levels is shown in Figure 18. Exceedences and actions undertaken/underway/proposed will be reported to DEC.

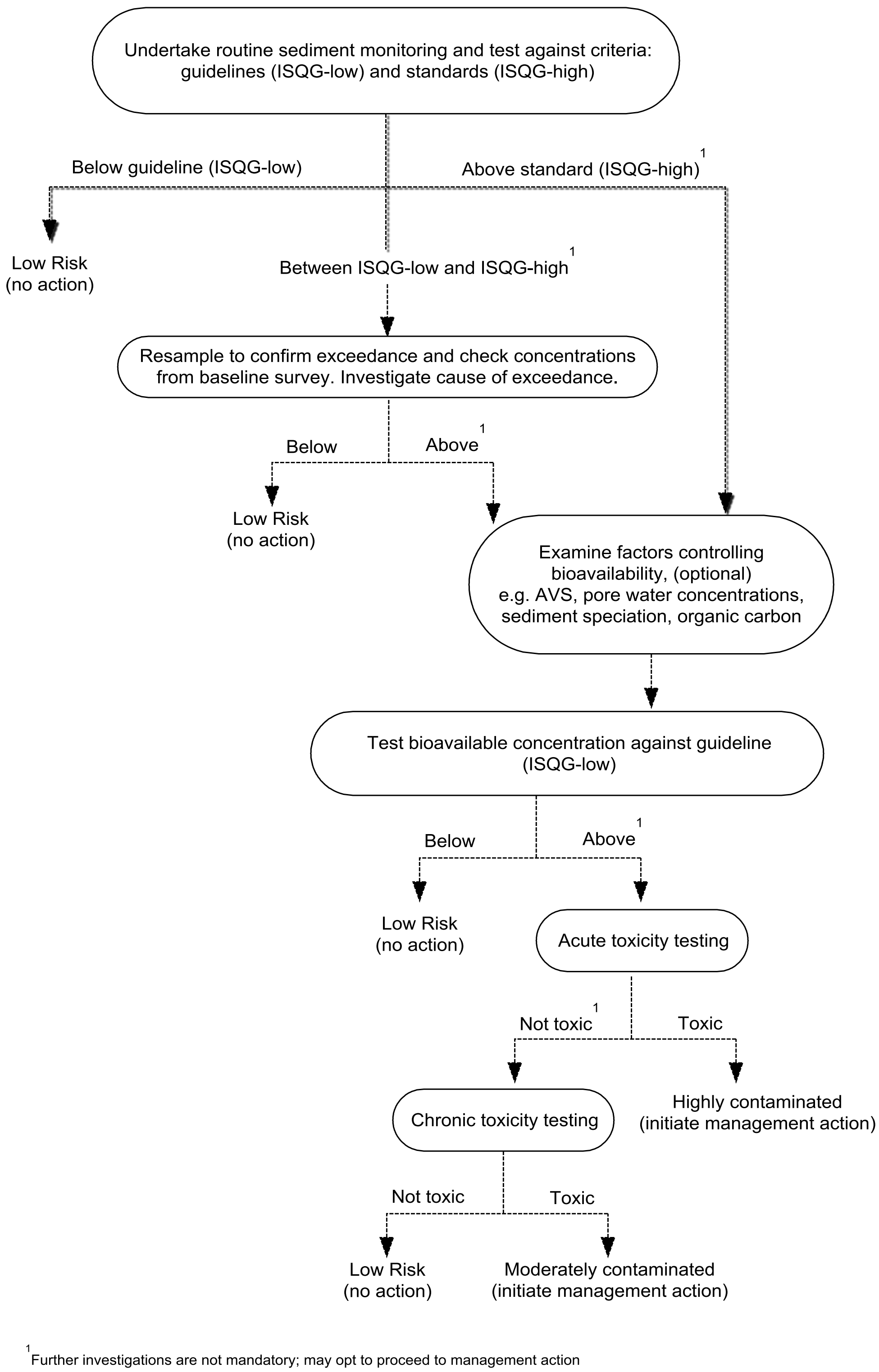

Figure 18 Management Response Framework in the event of an exceedence of Guideline Sediment Quality Trigger Levels

7.2 WATER QUALITY TRIGGERS

Water quality monitoring undertaken to meet requirements of Statement 822 will be compared against the values in Table 16.

Table 16 Water quality triggers

Parameter	Accuracy	Guideline value	Comments
Salinity	±0.2 ppt	The median salinity resulting from discharge at the wastewater diffuser either, (1) does not exceed the 95th percentile of the natural salinity range over the same period; or, (2) does not exceed the median salinity at a suitable reference site by more than 1.2 parts per thousand at the edge of the LEPA	This guideline has been derived as per Condition 8.4 - Item 1 of Statement 822
Temperature	±0.1 °C	The median temperature in any season does not exceed the 95th percentile of the natural temperature range over the same period at the edge of the LEPA.	This guideline has been derived as per Condition 8.4 - Item 5 of Statement 822
Dissolved Oxygen	±0.2mg/L at ≤ 20mg/L ±0.6mg/L at > 20mg/L	The ambient dissolved oxygen in bottom water samples is not below 80% saturation for more than six weeks and never below 60% saturation at the edge of the LEPA.	This guideline has been derived as per Condition 8.4 - Item 4 of Statement 822
Visual Indicators	N/A	As defined in Table 14	

Contingency actions for water quality will occur if any of the guideline values in Table 16 are exceeded. Contingency actions are detailed in Table 17.

Table 17 Contingency actions for water quality exceedences

Trigger	Contingency action
Water quality sampling parameters exceed guideline values listed in Table 16.	1. Confirm that the exceedence is correct by checking analyses, calculations and equipment calibration. 2. If exceedence is correct, establish causes by checking recent port and desalination operational factors. 3. Reactive monitoring, which could entail vertical profiling over a larger area. 4. If exceedence is caused by port operations, and is likely to be ongoing; re-assess the risk posed to the environment. This may include: • More intensive sampling and reporting • Additional or modifications to sediment and coral monitoring if there is the risk that contaminants will impact sediment or corals. 5. If risk is unacceptable (i.e. EPA objectives will not be met), design and implement remedial actions. These may include: • Adjustments to port processes or drainage flows • Modifications to infrastructure to reduce contaminant inputs 6. Report on exceedence and actions undertaken/underway/proposed to DEC.

7.2.1 IMP Contingency Actions

It is critical that any possible introduction of IMP be handled with the utmost urgency. It is only in the early stages of infestation that a species can be contained; once it becomes established removal of a pest species is very difficult, if not impossible. If a potential IMP is discovered, it will most likely be during monitoring at Cape Preston. Department of Fisheries (DoF) must be notified immediately.

If such an event occurs, specimens of the suspect species will be collected. DoF can advise on the most appropriate method of preserving the material and who would be the most appropriate scientist to identify the species.

Once notification of a potential IMP is received, DoF will assume the management role for determining an appropriate response. DoF will notify the Consultative Committee on Introduced Marine Pest Emergencies (CCIMPE) and will determine in consultation with CCIMPE whether the national protocols are invoked. The Port Manager will assist wherever possible with the response determined by the government agencies.

8. REPORTING

8.1 ANNUAL REPORT

Monitoring data will be included in the Sino Iron Project Annual Report and submitted to DEC. The Annual Report will outline results from the previous twelve months of monitoring, as well as any outcomes. In addition the following information will be supplied:

- Records of any sediment or water quality exceedences that were recorded, including details of contingency actions taken
- Records of any instances of changes in coral health at any of the monitoring sites, including a comparison with sediment and water quality data. Any contingency actions taken will also be included.
- Details of all hydrocarbon spills (either on the terrestrial areas of the port or in marine waters) that occurred in the reporting period, including details of containment and clean-up methods used. Details of any reports that have been made to the DPI during this time will also be included.
- Details of any breaches of the BW&HFMP, including contingency actions and follow up surveys.

8.2 COMPLIANCE REPORTS

Condition 14-1 of Statement 635 requires the submission of Compliance Reports to DEC which includes evidence of compliance with conditions. As part of the Compliance Report, the Proponent will present the results of the monitoring program as evidence of compliance with Condition 9-1 Item 1. This report will be provided annually.

8.3 PERFORMANCE REVIEW

Condition 14-2 of Statement 635 requires the submission of a Performance Review Report every six years to the requirements of the Minister for the Environment and the EPA. The following information in relation to the PEMP will be included in the Performance Review:

1. An overview of the results of the monitoring program for the preceding years of operation.
2. Any exceedences of the monitoring criteria and the response implemented.
3. Rationale for future monitoring required.

If all conditions have been met under all circumstances in the preceding years of operation and the risk of any future exceedence is considered very low, the Proponent may propose a reduced monitoring program to DEC for consideration in the Performance Review. If further management actions are required the proponent will review and update this PEMP in consultation with DEC.

8.4 REVISIONS

As per Statement 635 any significant amendments to the Port EMP, including Ballast Water and Bio-fouling Management Plan and Oil Spill Contingency Plan, where there is a change in the outcome will be referred to the EPA. In addition to this the DoFwill also be consulted with any changes in relation to the management of invasive marine pests and ballast water management.

The Port EMP, Ballast Water and Bio-fouling Management Plan and Oil Spill Contingency Plan are dynamic management plans and it is anticipated that they will be modified throughout operations to reflect changing legislation and monitoring findings.

Stakeholders such as the DoF will be consulted with before any amendments are made. Where there is a significant departure to the original approved plan the new plan will be submitted to the Minister for the Environment in accordance with Statement 635.

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Appendix 1

Oil Spill Contingency Plan – Cape Preston

Cape Preston Port

Oil Spill Contingency Plan (OSCP)

Xodus Environment

CITIC Pacific Mining

Assignment Number: P30036-S00

Xodus Group Pty Ltd
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Cape Preston Port
Oil Spill Contingency Plan
Xodus Environment
CITIC Pacific Mining
Assignment Number: P30036-S00

Client: CITIC Pacific Mining

Document Type: Report

Document Number: P-30036-S00-REPT-01-R00

Date: May 2009

0	May 2009	Issued for Use	D Prananto	F Baronie	F Baronie	
Rev	**Date**	**Description**	**Issued By**	**Checked By**	**Approved By**	**Client Approval**

DOCUMENT DISTRIBUTION

Company / Organisation	Name/Title	Location	Copies
CITIC Pacific Mining (CPM)			
Mineralogy Pty Ltd			
Department for Planning and Infrastructure			
Environment Protection Authority			

PURPOSE AND SCOPE OF THE PLAN

The Oil Spill Contingency Plan (OSCP) provides a procedural response to oil spill incidents in the marine environment resulting from activities within Project Port limits at Cape Preston, including all activities:

- at the trestle jetty
- inside the breakwater area; and
- at the transhipment location.

Operational activities are defined as those activities conducted by tugs, barges, transhipper, refuelling tanker, Heavy Lift Vessels and Ocean Going Vessels to import heavy lift modules and materials for use onshore Cape Preston, and those activities required to export product.

This OSCP complements the Port Emergency Response Plan (ERP). The Port ERP should be referred to for any spills of hazardous materials or for spills accompanied by other emergencies.

This OSCP outlines the steps required for the management of responses to marine oil spills that are the responsibility of the Port Operator. This OSCP principally describes the initial response actions in the event of a Tier 1 spill and identifies methods for escalating the response to include external response agencies if required.

This document should be read in conjunction with the Western Australian Marine Oil Pollution Emergency Management Plan (Westplan-MOP).

CONTROL AND UPDATE OF THE PLAN

This OSCP is a controlled document. It shall be revised in the following circumstances:

- after a period of 2 years
- on identification of a significant spill risk not currently included in this plan
- on amendments in relation to legal requirements
- on significant change to the operation or organisational structure

The Port Manager will be responsible for:

- controlling this document
- ensuring the OSCP remains valid and accurate
- supplying master electronic copies
- obtaining all signatures
- specifying the distribution list

HOW TO USE THIS OSCP

Section 1 INITIAL ACTION

- Summarises the notification procedure to be used in the event of an oil spill incident
  - A standard Marine Pollution Report form (POLREP) is provided in this Section
- Explains how to report and assess the movement of the spill
- Provides an action checklist for key personnel

USE THIS SECTION FIRST IF AN OIL SPILL OCCURS

Section 2 PRIORITIES

- States the priorities during an oil spill response
- Explains the Tier system for assessing the size and seriousness of a spill

Section 3 RESPONSE STRATEGIES

- Describes the characteristics and fate of spilled oil
- Describes recommended response strategies and provides a decision guide
- Provides guidelines on when to terminate the response

Section 4 ORGANISATION & MANAGEMENT

- Describes the organisation of the emergency teams and their roles

Section 5 DATA

- Provides a summary of Tier 1 anti-pollution equipment available onsite
- Includes an overview of metocean data and environmental sensitivities of the area

Section 6 FORMS & CHECKLISTS

- Provides all the forms and checklists appropriate for the response operation

Section 7 BACKGROUND

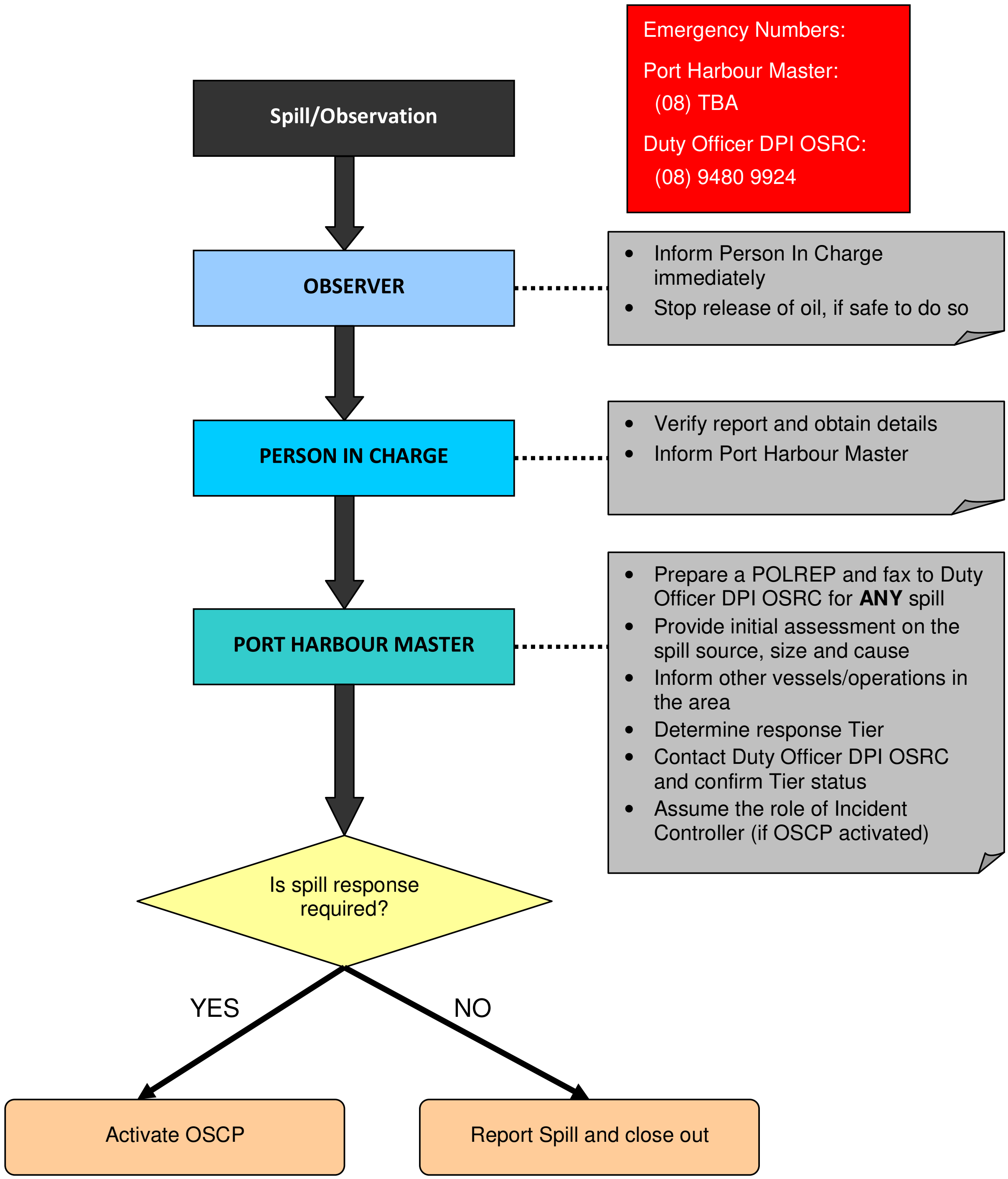
- Describes the purpose, scope and legislative background of the OSCP
- Describes interfaces to other contingency plans
- Explains terminology used in the OSCP

Appendices

- Provides contact details for all relevant personnel/agencies
- Maps

1 INITIAL ACTION

1.1 Spill Reporting Procedure



1.2 Marine Pollution Report Form (POLREP)

Marine Pollution Report - POLREP			
Date of Incident		Time of Incident *(24hr format):*	
Location Name / description:			
Latitude:	° ‘ ”	Longitude:	° ‘ ”
Description of Incident:			
Pollution Source:			
Identity & Position of Adjacent Vessels (if source unknown):			
Cause of Discharge:			
Oil Type or Description:			
Amount of Pollutant (if known):			
Size of spill (length and width):			
Has Discharge stopped:	Yes / No / Unknown		
Movement & Speed of Pollution:			
Weather / Sea / Tide Condition:			
Statutory Agency:		Combat Agency:	
Initial Response Action:			
Samples Taken: Yes / No		Photographs/Video Taken: Yes / No	
Additional Information:			
Reported by:		Company:	
Phone:	Fax:	Mobile:	

This form to be completed with as much of the above information as possible and **send to**:

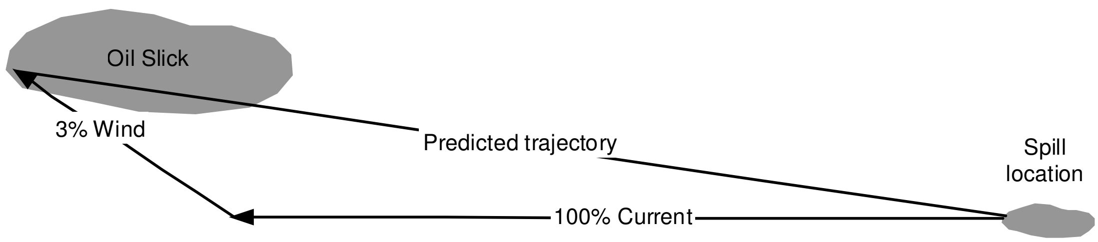
Department of Planning and Infrastructure – Oil Spill Response Coordination Duty Officer:

Fax: (08) 9216 8982 or email: marine.pollution@dpi.wa.gov.au

FOR ANY ADDITIONAL INFORMATION PLEASE ADD EXTRA PAGES AS REQUIRED

1.3 Further Action

- Obtain information on tides & direction/speed of current and wind
- Using observations and information on current and wind, predict the trajectory and speed of movement of the spill. The vector calculation below provides a rough estimate:



- Record slick movement on a chart (map) with co-ordinates, showing position and predicted movement of the oil
- Request vessels or aircraft to provide surveillance of the spill if appropriate, to provide observation and recording of the size and location of the slick. Over-flights should be carried out at least twice a day.
- Record slick observations on the form provided in **Section 6.4**
- Note that the colour of the oil on water can indicate its thickness. Use the Bonn Agreement Oil Appearance Code (BAOAC) colour chart below (Table 1-1), to assist calculation of an estimated volume of oil based on the area and colour of oil visible from the aerial observation
- Once the size and movement of the spill are known, the Incident Controller can assess the potential danger to people and nearby facilities, and if necessary set safety exclusion zones
- The predicted movement of the slick will guide responders to the right locations for response and/or clean-up
- Consider requesting real-time oil spill modelling from the Australian Maritime Safety Authority (AMSA) to provide a back up to plotted results (form provided in **Section 6.3**)
- The Incident Controller must also gather additional key information about the incident from the On Scene Coordinator. This additional information shall be recorded on the Situation Report (SITREP) form (**Section 6.2**)
- Activate the response action based on the size and threat caused by the spill

Table 1-1 Guidelines for estimation of slick volumes

Code	Description / appearance	Layer thickness interval (µm)	Litres per km^2
1	Sheen (silvery/grey)	0.04 to 0.30	40 – 300
2	Rainbow	0.30 to 5.0	300 – 5,000
3	Metallic	5.0 to 50	5,000 – 50,000
4	Discontinuous true oil colour	50 to 200	50,000 – 200,000
5	Continuous true oil colour	200 to More than 200	200,000 - More than 200,000

1.4 Action Checklists

1.4.1 Incident Controller

Incident Controller	
ENSURE SAFETY IS THE PRIMARY CONCERN	
Step	**Actions**
Alert	❑ Respond immediately to any oil spill notification from site personnel ❑ Obtain details of the incident: – Fire or explosion? – Injuries? – Gas / vapour hazard? – Location? – Type of oil spilled? – Estimated quantity of spill? – Cause of spill? – When did the spill occur? – Is it continuing to spill? ❑ Carry out a Tier Response Assessment (**Section 2.2**) ❑ Complete a POLREP form (**Section 1.2; Section 6.1**) and send the POLREP to DPI OSRC ❑ Mobilise Emergency Control Coordinators (ECCs) and Emergency Response Team (ERT)
Initial Actions	❑ Start a Personal Log (form in **Section 6.5**), and record time and details of own actions and own decisions. ❑ Manage the operations of the ECCs. ❑ Appoint key positions within the ECCs e.g. HSE Coordinator ❑ Identify the hazards and dangers to personnel in the spill area ❑ Identify appropriate safety precautions for personnel who have to enter or work in the spill area ❑ Assess the spill in greater detail. See **Section 2.2** of this plan for advice on spill assessment. ❑ Analyse the spill size and movement: – Request a vessel or aerial observation (a trained member of the ERT should be on board if possible to gather information on the slick) – Estimate the speed and direction of current at the spill site – Estimate the speed and direction of wind at the spill site – Where is the spill moving? How fast is it moving? ❑ Draw the predicted movement of the slick on a map showing times when the oil will reach sensitive areas (refer to **Section 1.3** on spill assessment and **Section**

Incident Controller	
ENSURE SAFETY IS THE PRIMARY CONCERN	
Step	**Actions**
	5.2 and Appendix D for details of sensitive areas) ❑ Request real-time oil spill modelling runs from AMSA (form in **Section 6.3**) ❑ Post all information on the slick on the status board in the Emergency Control Room (ECR) ❑ Liaise with appropriate authority
Further Actions	❑ Maintain 'up to the minute' knowledge of the situation and continue to evaluate the spill ❑ Send regular progress reports using the SITREP form (**Section 6.2**) to the Duty Officer DPI OSRC ❑ Ensure all media communication is made through the Port Operator ❑ Approve external communications to employees and relatives ❑ Prepare to meet and brief specialist response personnel if these have been mobilised ❑ Arrange for food, refreshment and rooms for the response personnel arriving on scene
Final Actions	❑ Decide when response is to be terminated (see **Section 3.8** for guidance) ❑ When safe to restart, approve restart of normal site operations ❑ Hold debrief for on site personnel who were involved in the response ❑ Collate records and logs ❑ Conduct incident investigation

1.4.2 On Scene Coordinator

On Scene Coordinator	
ENSURE SAFETY IS THE PRIMARY CONCERN	
Step	**Actions**
Alert	❑ Respond immediately to any oil spill notification from site personnel ❑ Quickly carry out an initial assessment on the spill source, size and cause ❑ Communicate with and support Incident Controller (IC) ❑ Mobilise the Emergency Response Team (ERT) ❑ Brief the ERT on the incident ❑ Check all communications, response equipment and PPE
Initial Actions	❑ Start a Personal Log (form in **Section 6.5**), and record time and details of own actions and own decisions. ❑ Regularly liaise/update the Incident Controller of the situation ❑ Once the scale and movement of the spill are known, request support / additional procurement of equipment, manpower and services via the Incident Controller if required ❑ Ensure that every individual in the intervention team knows their role and responsibilities, for example: – Second-in-command – Gas/vapour monitoring – Fire fighting – First aid – Spill surveillance ❑ Give instructions to the team concerning – On-site communications – Safety precautions – Actions to take if someone is injured ❑ Before departing for the spill site, organise the transportation of all emergency response equipment and required PPE ❑ On arrival at the site of the spill – Carry out an on-site assessment to identify hazards – Obtain information about the spill – Record speed and direction of wind and current – Set up exclusion zone if necessary (No smoking area) – Specify muster points

On Scene Coordinator	
ENSURE SAFETY IS THE PRIMARY CONCERN	
Step	**Actions**
	– Maintain communications with the Incident Controller – Provide status reports – Obtain guidance on selection of response strategy (**Section 3**) – Ensure that everyone in the area of the spill uses appropriate PPE depending on the hazards and the response actions being taken – Check communications with everyone on site
Further Actions	❑ Maintain 'up to the minute' knowledge of the situation and continue to evaluate the spill ❑ Prepare to meet and brief specialist response personnel if these have been mobilised by the Incident Controller ❑ Create a 'controlled entry' zone around the spill ❑ Ensure that only properly authorised personnel have access to the spill site ❑ Record the locations and tasks of all personnel visiting or working at the site of the spill ❑ Supervise the ERT and manage the initial deployment of spill response equipment and boats ❑ Request the Logistics Coordinator to provide additional supplies of response materials and PPE (as required) ❑ Quantify the volume of oil spilled, volume dispersed and volume recovered ❑ Ensure that contractors daily work hours and activities are recorded (form in **Section 6.8**)
Final Actions	❑ Decide when response is to be terminated (see **Section 3.8** for guidance) ❑ Hold debrief for on site personnel who were involved in the response ❑ Prepare a debriefing report in writing, containing: – Actions taken during the response – Accidents and 'near misses' – Recommendations for the future (e.g. procedures, training, equipment) ❑ Collate records and logs ❑ Give logs and debriefing report to the Incident Controller

1.4.3 Emergency Control Coordinators

Emergency Control Coordinators	
ENSURE SAFETY IS THE PRIMARY CONCERN	
Step	**Actions**
Alert	❑ Respond immediately to the alarm ❑ Mobilise to the Emergency Control Room (ECR) ❑ Advise the Incident Controller if there is a need to evacuate an area ❑ Mobilise medical, fire fighting and other emergency support as required ❑ If the spill or leak is from a vessel, ensure the vessel master has implemented the appropriate emergency response plan
Initial Actions	❑ Each ECC must start a Personal Log (form in **Section 6.5**), and record time and details of own actions and own decisions. ❑ Ensure that there is someone recording the incident events on a computer or on the board in the ECR. ❑ Write information on the status boards on the wall of the ECR as soon as possible, and update the status boards regularly ❑ Assist On Scene Coordinator (OSC) in deciding how to stop the spill or leak ❑ Decide on how to reduce risk of fire or explosion ❑ Identify the hazards and dangers to personnel in the spill area ❑ Identify appropriate safety precautions for personnel who have to enter or work in the spill area ❑ Only allow personnel to go into the danger area if they have been properly informed of the situation and the appropriate safety precautions (e.g. they are properly prepared to assess gas or vapour hazards) ❑ If OSC requests, mobilise helicopters and / or boats to assist with spill assessment and response ❑ Once the scale and movement of the spill are known, it is possible to analyse the potential danger to people: – Who is most at risk? – When will they be at risk? – If necessary, organise evacuation ❑ Keep one another and the Incident Controller informed of events and important actions taken ❑ Mobilise personnel, equipment and boats to support the ERT with clean-up, logistics, storage of recovered oil
Further Actions	❑ Maintain ‘up to the minute’ knowledge of the situation and continue to evaluate the spill ❑ Use maps, photos and whiteboards in the ECR to show details of the spill

Emergency Control Coordinators	
ENSURE SAFETY IS THE PRIMARY CONCERN	
Step	**Actions**
	❑ Record location, number and status of: – Personnel – Equipment – Boats ❑ Arrange for food, refreshment and rooms for additional response personnel arriving on site
Final Actions	❑ When safe to restart, approve restart of normal site operations ❑ Hold debrief for on site personnel who were involved in the response ❑ Give logs of the incident and other relevant records to the Incident Controller

1.4.4 On Scene Safety Procedure

On Scene Safety Checklist	
ENSURE SAFETY IS THE PRIMARY CONCERN	
Step	**Actions**
Alert	❑ Is the spill at a location where there are personnel working? If 'yes', then – person nearest to the spill raises the alarm and immediately carries out all fire, gas and explosive vapour safety precautions
Prior to work at spill site	If you plan to visit or work at the site of a spill, ensure that you ❑ Are fully aware of the hazards, which may occur. For example, gas, explosive vapour, fire risk, and dangers when using response equipment or chemicals ❑ Attend a safety briefing before going on site ❑ Obtain appropriate PPE ❑ Carry or have quick access to communications equipment ❑ Check that PPE and communications equipment are in good working order
At the spill site	When you arrive at the site of the spill ❑ Assume fire or explosion risk until proven otherwise ❑ Assume gas hazard until proven otherwise ❑ Wear and/or carry PPE ❑ Monitor the speed and direction of wind and current at the spill location ❑ Carry out an on-site assessment to identify hazards. ❑ Test communications ❑ Know the locations and tasks of others on site, and ensure that they are aware of your location and task ❑ Be aware of muster points, evacuation routes and on site alerting system ❑ Be aware of danger zones and the areas where entry is forbidden for people or boats or helicopters ❑ Know what actions to take if someone is injured (i.e. first aid and MEDEVAC procedures) ❑ Prevent people, aircraft and vessels from entering designated exclusion areas ❑ Use the correct spill response equipment. ❑ Observe correct safety procedures for working in boats, handling response equipment. ❑ Regularly reassess safety hazards to yourself and to other team members ❑ Report all accidents and near misses

2 PRIORITIES

2.1 Response Priorities

The response priorities for all marine oil pollution emergencies are the protection of:

1. Human safety.
2. Habitat and cultural resources.
3. Rare and/or endangered flora and fauna.
4. Commercial resources.
5. Recreational and amenity areas.

Environmental protection priorities will focus on environmental protection of Preston Island and surrounding coral and ecological communities present within and in the vicinity of the project site. These priorities may need to consider the likelihood of success of a response and overall ecological value of the various resources under threat. Net environmental benefit considerations will dictate response decisions, for example, in the use of chemical dispersants.

2.2 Tier Response Assessment

This OSCP principally describes the initial response actions in the event of a Tier 1 spill and identifies methods for escalating the response to include external response agencies if required.

Marine pollution response is based on a level of response whereby the amount of resources deployed, and the response team in control, will vary according to the scale and location of the incident.

Levels of response or response tiers are defined by:

- The amount and source of resources deployed; and
- The levels of support and higher-level management activated.

The Port Operator has adopted a structured tiered response philosophy to oil spill responses. The purpose of this approach is to establish, as soon as possible, the correct level response required to combat the spill.

A definition of each Tier Response level (Tiers 1 to 3) is outlined in Figure 2-1.

Note: Indicative only, a spill may be escalated depending on threat level (see Section 2.2.1)

Figure 2-1 Tiered Response Strategy

TIER 1 RESPONSE	
❑ Small oil spills, or those which can be quickly and easily cleaned up using on-site resources ❑ Spill volume is less than 10 tonnes (80 bbls) ❑ Able to respond to the spill immediately	❑ Day time release ❑ Spill has stopped ❑ Oil will not impact environmentally sensitive areas ❑ Sufficient CPM / contractor personnel available
TIER 2 RESPONSE	
❑ Oil spills which pose a threat of significant pollution resulting in the activation of the local authorities' emergency response plans, and the mobilisation of external oil spill response resources ❑ Spill volume between 10 to 1000 tonnes (80-8,000 bbls) ❑ Danger of fire or explosion	❑ Night time / poor visibility ❑ Continuous release ❑ Oil is moving towards environmentally sensitive area(s) ❑ Other company's operations impacted ❑ National media attention
TIER 3 RESPONSE	
❑ Covers catastrophic spills, which require the mobilisation of national and/or international support ❑ Major incident causing oil spill of more than 1,000 tonnes (>8,000 bbls)	❑ Death or potentially very serious threat to life ❑ Catastrophic impact on local and regional communities ❑ International media attention

2.2.1 Additional Tier Level Assigning Factors

The Tier response assessment takes into account more than just spill size and distance. It includes many of the factors which could result in the oil spill having greater social, environmental or economic consequences, and potential impacts on business reputation or operations.

- Potential for further spillage;
- Type of oil and its characteristics, e.g. rate of evaporation & persistence of the oil;
- Effectiveness of immediate action to stop the spill continuing and to contain at source;
- Where the oil is moving – what / who is at risk?
- Daylight hours remaining until nightfall;
- Weather conditions will play a major part in the technical decision-making and could mean that response operations are more complex, or expensive, or take longer to complete;
- Other difficulties associated with the incident, e.g. fire, injuries (MEDEVAC), emergency shut-down or stopping of operations, abandon ship, vessel salvage operation;
- Equipment and resources available and speed of deployment;
- Location of the spill. The location of the spill may be difficult to reach, or could involve complex logistics, or may pose safety risks for responders;
- Media attention;
- Possible effects on people, businesses and communities, taking into account the knock-on effects on the local economy;
- The time of the year may be significant, for example whale, bird, fish and turtle migration, breeding season, commercial fishing season, weather patterns, holidays, etc.

3 RESPONSE STRATEGY

3.1 Spill and Incident Scenarios

Risk and incident scenarios were identified for activities within Project Port limits at Cape Preston for the purposes of oil spill response planning. Credible spill scenarios that are likely to occur as a result of port activities are provided in Table 3-1.

Table 3-1 Indicative Oil Spill Volumes from Various Spill Scenarios

Location	Incident	Oil Type	Volume (litres)	Volume (tonnes)
Transhipment Location	Refuelling incident (medium spill)	Diesel	5,000	4.2
	Transhipper fuel tank rupture (large spill)	Diesel	100,000	84
	Ocean Going Vessel fuel tank rupture (small spill)	Heavy Fuel Oil	9,900	10
	Ocean Going Vessel fuel tank rupture (medium spill)	Heavy Fuel Oil	99,000	100
Inside Breakwater	Incident with Tug (small spill)	Diesel	500	0.42
	Incident with Heavy Lift Vessel (small spill)	Heavy Fuel Oil	9,900	10
Jetty	Ocean Going Vessel fuel tank rupture – collision (small spill)	Heavy Fuel Oil	9,900	10
	Ocean Going Vessel fuel tank rupture – grounding (large spill)	Heavy Fuel Oil	495,000	500

* Assuming marine diesel density of 0.84 and HFO density of 0.99

In addition to diesel fuel and heavy fuel oil, small volumes of lubricating oil or hydraulic oil may also be spilled during operational activities in the Port. These are not included in the scope of work for assessment of risk, likelihood and potential impacts.

The amount of actual volume in a spill incident will depends on a number of factors:

- the capacity of and number of tanks damaged;
- location and height of impacted area above the waterline;
- quantity of fuel in the tanks; and
- capability of the vessel to reduce the outflow.

3.2 Properties and Behaviour of Spilled Oil

When oil is spilled into the sea it undergoes a number of physical and chemical changes, some of which lead to its removal from the sea surface, whilst others cause it to persist. These changes are important as the physical properties of the oil determine the choice of clean-up techniques and the long-term persistence of the oil.

Properties and behaviour of potential oil spilled from CPM activities are detailed in Table 3-2.

Table 3-2 Properties and Behaviour of Spilled Oil

Oil	Specific Gravity	Oil Group*	Behaviour at sea	Comments
Heavy Fuel Oil	>0.95	IV	Viscous, residual oils that spread slowly and form persistent emulsions in the sea. Low toxicity but significant smothering action.	Used by bulk ore vessels
Marine Diesel	0.84-0.88	II-III	Rapidly spreading oil with moderate evaporation and emulsification and relatively low persistence (2-3 days) in the sea. Generally highly toxic.	Represents the highest volume of fuel oil to be used in bunkering and import operations
Hydraulic oil	0.85-0.9	III	Hydraulic oil is relatively viscous and is not easily assimilated by the environment. Expect limited spread and minimal loss through evaporation and natural dispersion. The action of mixing energy is likely to produce a frothy emulsion.	Unlikely to be transported or used within Port operations
Lubricating oil	0.86-0.88	III	Lubricating oil is relatively viscous and is not easily assimilated by the environment. Expect limited spread and minimal loss through evaporation and natural dispersion. The action of mixing energy is likely to produce a frothy emulsion.	May be discharged with bilge waters or escape in the event of a hull rupture

*Classified according to International Tanker Owners Pollution Federation (ITOPF) and the US Coast Guard.

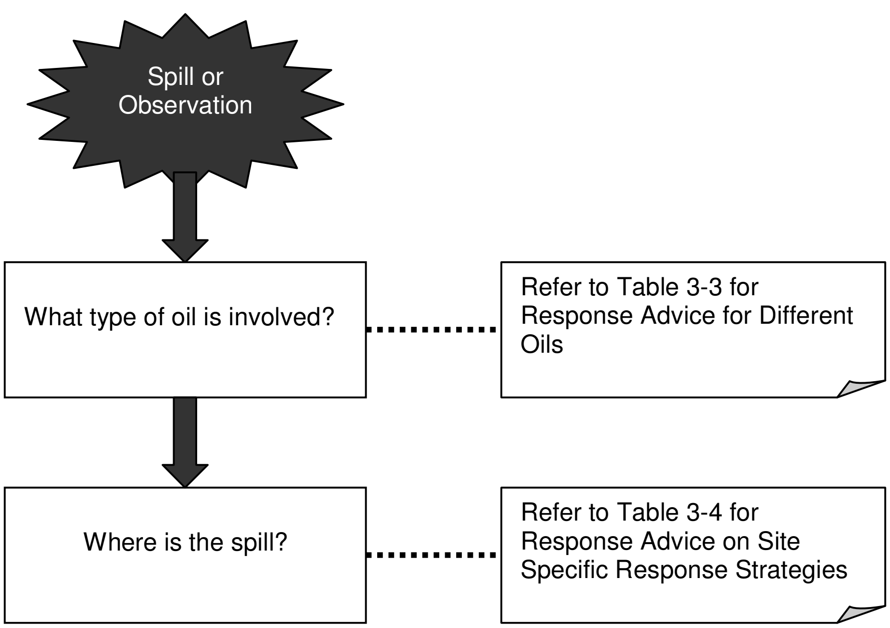
3.3 Response Strategy Selection

Having defined probable spill scenarios (Table 3-1) and considered the likely behaviour of the spilt oil (Table 3-2) and the resources under threat, consideration should be given to viable response strategies. This Section is designed to aid in the decision making process on which is the most appropriate strategy for the spill depending on type and location. Note that consideration of the net environmental benefit of the overall response is an important consideration and that the relative risks associated with response actions need to be assessed.

In summary, the main strategies available for the current operation are:

- Monitor and evaluate
- Containment and recovery
- Physical break-up
- Chemical dispersant application
- Shoreline protection
- Shoreline clean up.

USE THIS FLOWCHART TO AID THE RESPONSE STRATEGY SELECTION



N.B. A degree of flexibility is required as more than one strategy might be appropriate, and the chosen strategy could well change with time as the incident develops.

Table 3-3 Response guidelines for typical hydrocarbon spills

		Oil Type		
		Diesel	Heavy Fuel Oil	Hydraulic or lubricating oils
Recommended Strategy	Monitor and Evaluate	**YES** ☑ See Section 3.4.1	**YES** ☑ See Section 3.4.1	**YES** ☑ See Section 3.4.1
	Physical Break-up	**YES** ☑ See Section 3.4.2	**NO** ☒ See Section 3.4.2	**NO** ☒ See Section 3.4.2
	Containment and Recovery	**YES** ☑ See Section 3.4.3	**YES** ☑ See Section 3.4.3	**YES** ☑ See Section 3.4.3
	Chemical Dispersant Application	**NO** ☒ See Section 3.4.4	**YES** ☑* See Section 3.4.4	**NO** ☒ See Section 3.4.4
	Shoreline Protection	**YES** ☑ See Section 3.4.5	**YES** ☑ See Section 3.4.5	**YES** ☑ See Section 3.4.5
	Shoreline Clean Up	**YES** ☑ See Section 3.4.6	**YES** ☑ See Section 3.4.6	**YES** ☑ See Section 3.4.6

*May have limited effectiveness. Ensure the dispersant has been approved for use and any necessary authorisation has been granted.

Table 3-4 Response guidelines in relation to spill location

	Oil Type	Marine Diesel	Hydraulic Oil	HFO	Marine Diesel	Hydraulic Oil	HFO
Recommended Strategy	Location	Inside Breakwater/Jetty/Near Shore			Transhipper/Open Sea		
	Natural Processes	R	F	N	R	F	N
	Physical Break-up *See Section 3.4.2*	R	F	N	R	F	N
	Containment & Recovery *See Section 3.4.3*	R	R	R	C	C	C
	Sorbent recovery	R	R	R	C	C	C
	Dispersant Application *See Section 3.4.4*	N	C	C	C	C	C

Note:

R **Recommended – Preferred option**

F **Feasible, but not preferred option**

C **Conditional, possibly useful but may have adverse effects or logistical effects**

N **Not applicable or not recommended**

Scenario specific response strategy is detailed in Appendix C

3.4 Response Strategy Guidelines

Use the following sections to gain further detail and guidance on strategies chosen.

3.4.1 Monitor Movement and Identify Dangers

ALL SPILLS ARE TO BE MONITORED AND EVALUATED CONSTANTLY

- Assume that there is a risk of gas and vapour close to the spill site until proven otherwise
- If the incident occurs at night time or just before nightfall:
  - Spilled oil and diesel are invisible at night, and cannot be seen even with searchlights
  - Aircraft are not useful for observation at night unless they are equipped with infrared cameras
  - The Incident Controller must gather all information possible about the conditions of the tide, current and wind at the scene of the incident, and then calculate where the slick may move
  - Without full information, the Incident Controller must predict the worst case scenario, in terms of maximum possible volume of oil or diesel spilled, and in terms of the maximum distance that the spill may move from the source
  - Before boats are used at night, (for example to warn other boats to stay away from the source of the spill), the Vessel Master should be fully briefed about the details of the incident, and where the spill may move
  - Boats should not take any risks and in particular should not move in areas where there may be a risk of gas or explosive vapour
- A spill will spread rapidly and move at the speed of the current. This makes it difficult to track the movement of a spill on water by boat, so in the event of a large spill:
  - Request a vessel/aircraft to observe the slick in order to assess the size and movement, if appropriate
  - Have one member of the Emergency Response Team on board the aircraft/vessel to take photos and notes, record the colour and appearance of the slick
  - Observe the direction and speed of the current at the spill site. Record this information on the status board in the Emergency Control Room
  - Make a request to AMSA (form in **Section 6.3**) to run a computer model to predict spread, weathering and movement of the oil spill
  - On a map in the ECR, draw the position of the slick, note the direction of movement of the spill and the time it is predicted to reach installations / coastline in its path

3.4.2 Physical Break-up

PHYSICAL BREAK-UP – DIESEL ONLY

- Assume that there is a risk of gas and vapour close to the spill site until proven otherwise
- Immediately implement all fire, gas and explosive vapour safety precautions
- Prevent further spillage (i.e. stop the spill or isolate the source)
- Quickly assess the size of spill and where it is moving, ideally by helicopter
- Consider establishing temporary vessel and helicopter exclusion zones
- Use fire-fighting hoses or propeller wash to break up and to disperse the slick:
  - **DO NOT** use physical break-up methods on Heavy Fuel Oil or lubricating/hydraulic oils – as they tend to emulsify if mixing energy is applied.
  - This technique can also be used to divert oil from sensitive areas in a high current situation or to dislodge trapped oil and divert or herd it to containment and recovery areas in low current stagnant water bodies.
  - Physical break up disperses oil into the water column. Tradeoffs among other resources at risk, such as potential effects of temporarily higher concentrations of oil in the water column on pelagic organisms and coral reefs, should be considered before using this technique.
  - When used near shore or in shallow waters, it may generate a high level of suspended sediments, and mix them with the oil to deposit contaminated sediments in benthic habitat.
- Monitor spill movement
- When there is no further danger from the spill, advise nearby ships and facilities and lift any temporary exclusion zones established as a result of the spill

3.4.3 Contain and Recover

CONTAINMENT AND RECOVERY

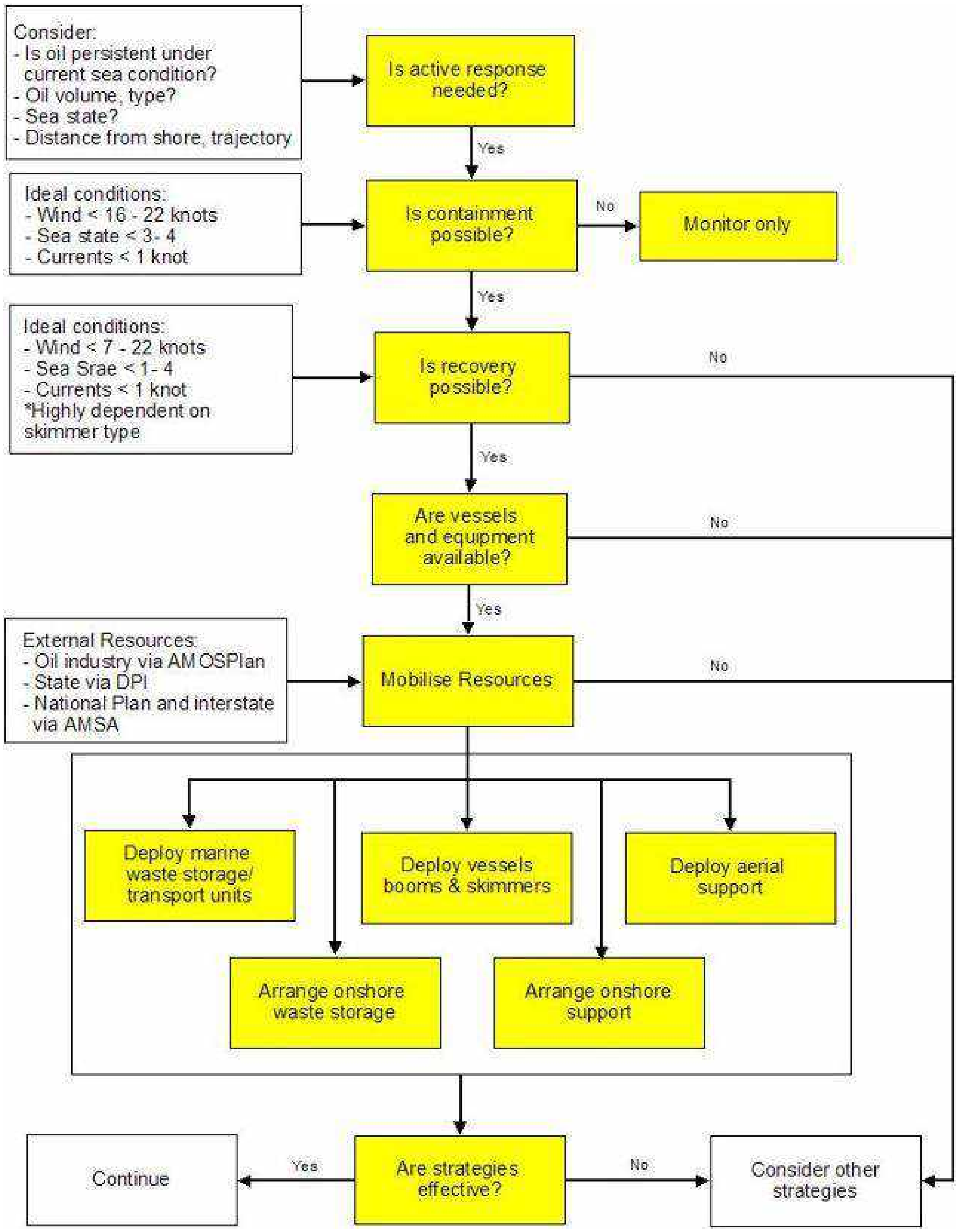
- If weather conditions are favourable then containment and recovery of oil may be possible using a boom and skimmer (See Figure 3-1 for boom and skimmer deployment limitations)
  - Boom should be deployed by trained personnel with the support and guidance of the On Scene Coordinator (OSC).
  - Deploy skimmer and recover product to temporary storage
  - The logistics of storage and transfer of recovered oil needs to be planned by the on-site response team
  - It is important to trap the oil before it spreads, but care should be taken when booming oil close to the source of an ongoing spill, due to the risks of gas and explosive vapour
- OSC requires a good understanding of the techniques for deploying booms and a knowledge of their operational limitations. Use decision support guide (Figure 3-1) to aid in process:
  - Place the boom at an angle to the current strength. Entrainment or loss of oil under the boom begins to occur when a boom is placed perpendicular to a current > 0.75 knots
  - A cascade booms can be used in strong currents where it may be impossible to effectively deploy one continuous section of boom.
  - Long length of boom require anchoring every ~100m
- Use sorbent booms (or sorbent snares) parallel to the current to:
  - create a seal between a boom and the shore
  - recover oil from sumps, drainage ditches, vessel bilges
- Use sorbents pads or rolls to:
  - remove oil from piles, jetties, boat hulls
  - protect walkways and decks

Note: sorbents contain oil, but also leach oil. Do not use them at right angles to a flow of water or they will leach oil. The faster the current, the greater the leaching of oil.

SPECIFIC GUIDELINES FOR CONTAINMENT AND RECOVERY

- It is important to consider all components when using containment and recovery as a response technique. For successful containment and recovery, a balance shall be achieved between:
  - Containment (boom deployment).
  - Recovery (skimmers).
  - Temporary waste storage (on-deck storage, dracones, barges etc.).
  - Waste transport and onshore waste receiving capacity.
- For vessel moored alongside the jetty or inside the breakwater area, deploy boom around the vessel to contain spill.

Figure 3-1 Containment and Recovery decision support guide

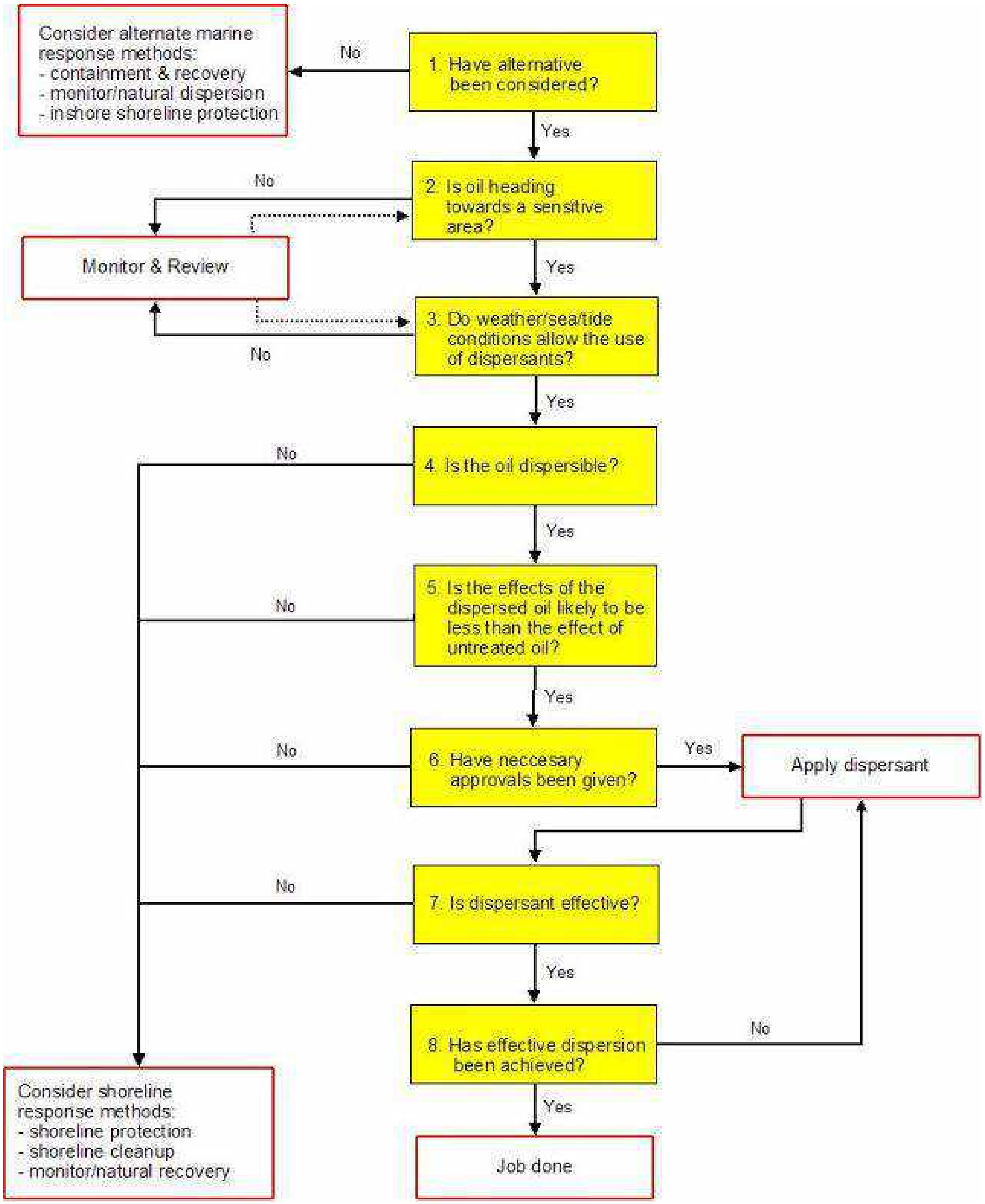


3.4.4 Dispersant Application

USE OF DISPERSANTS

- Assume there is a danger of explosive vapour or gas close to the source of the spill until assessed otherwise
- Prevent further spillage (i.e. stop the spill or isolate the source)
- Quickly assess the size of spill and where it is moving, using vessels and aircraft if required
- Consider establishing temporary vessel and aircraft/helicopter exclusion zones
- Monitor the movement of the oil using vessels or aircraft if required. If the oil is moving into open water, away from sensitive marine environments dispersants may not be required
- Use the decision support guide (Figure 3-2) to aid in decision making process
- Authority to use dispersants must be sought. **Contact the State Environment and Scientific Coordinator via DPI OSRC for approval to use dispersant** NOTE: (Westplan MOP Appendix L):
    - The decision to use dispersants should be made in consultation with the appointed Environmental and Scientific Coordinator (ESC). However, the Incident Controller may authorise the use of dispersants, without consultation, in order to reduce any threat to human life from fire or explosion.
    - Appropriate dispersant effectiveness testing should be conducted prior to submitting approval to use dispersant.
    - Authorisation must be based on a reasonable belief that the application of the dispersants will be effective and that there will be a net environmental benefit from their use.
    - The decision to continue use must be based on demonstrated effectiveness, either through visual confirmation or field sampling programs.
- Dispersant use in shallow water may not allow for adequate dilution and may result in possible impacts on seafloor (benthic) marine life
- Dispersants should not be used on light oils, such as diesels or on sheen
- As oil weathers it becomes more viscous and may emulsify rendering dispersants less effective. If the decision is taken to use dispersants, they should be applied as soon as safe and practicable to do so
- Dispersants may become less efficient on oils of higher viscosity, i.e. above 2,000cSt, or on emulsified oils.
- Ensure that the effectiveness of dispersant operations is closely monitored
- Dispersant should be applied by trained operators, with proper safety equipment, and with experience in use of the spray equipment
- Dispersants should be applied by a spraying method only with correct equipment, with a suitably designed droplet size application. Spraying can be by suitably equipped aircraft or boat

Figure 3-2 Dispersant use decision support guide



3.4.5 Shoreline Protection

SHORELINE PROTECTION

Use the table below for guidance and advice on protection techniques depending on the shoreline type that is impacted. Further advice on techniques can be provided by the DPI OSRC team.

Shoreline	Energy	Method	Constraint and comment
Cliffs or bedrock	Medium-High	No inshore or shoreline protection methods are likely to be effective.	High energies make protective methods unlikely to succeed. Wave action will overcome any barriers or booms.
Boulder beaches	Medium-High		
Cobble beaches	Medium-High		
Pebble beaches	Medium-High		
Sand beaches	High	Deflection booming	If oil movement is along the shore, oil can be deflected from sensitive parts of the beach.
	Medium	Exclusion booming	Either inshore, light boom or sorbent boom, or onshore. For example beach guardian boom.
	Low	Sand barriers	Push sand down the beach to form a barrier to the incoming oil. Suitable for very low energy beaches only.
		Loose sorbents	These may be used to stabilise oil coming ashore or on shore and prevent oiling of wildlife.
Mud or sand flats	Low	Deflection booming	Deflect oil from flats. Often limited application due to the expanse of the area.
		Exclusion booming of small areas	Use either beach or shore guardian boom or sorbent boom or snares.
Inlets and tidal creeks	Medium	Deflection booming	Deflect oil to shore. Deploy barrier boom within creeks at a point where the flow is less than 0.75 knots.
	Low	Earth barrier, dam or sandbag dams	Push earth over inlet mouth. Cover in plastic and hold in place with sandbags to avoid the dam being washed away.
Salt marsh	Low	Exclusion booming	Block inlets.
		Earth or sandbag dams	Across inlets only if booms are not available. Be careful of potential damage to salt marsh.
Mangroves	Low	Deflection booming	Deflect before oil moves into mangrove areas.
		Barrier, such as berms, dams, and booms	Barriers can be used along mangrove shorelines and inlets to prevent oil entry

3.4.6 Shoreline Cleanup

SHORELINE CLEANUP

Use the table below for guidance and advice on clean up techniques depending on the shoreline type that is impacted. Further advice on techniques can be provided by the DPI OSRC team.

Habitat type	Cleanup techniques			
	Preferred	Viable	Not advisable	Avoid
Mangrove forest	boom and skim where appropriate low-pressure flushing enhance drainage	sorbents natural recovery manual removal vacuum/pumping dispersants	high-pressure flushing	burning sinking agents substrate removal
Lagoons	boom and skim where appropriate natural recovery vacuum/pumping	manual removal sorbents	dispersants	burning sinking agents
Salt marshes	boom and skim low-pressure flushing enhance drainage natural recovery	dispersants sorbents bioremediation	manual cutting	burning high-pressure flushing manual removal sinking agents substrate removal
Soft bottom intertidal habitat	natural recovery	manual removal	substrate removal vacuum/pumping	sinking agents
Rocky intertidal kelp beds	natural recovery	boom and skim low-pressure flushing sorbents manual cutting dispersants	high-pressure flushing vacuum/pumping	burning sinking agents
Coral reefs	boom and skim where appropriate natural recovery	Sorbents low-pressure flushing (on reef flats)	manual removal	Dispersants high-pressure flushing substrate removal
Intertidal seagrass bed	low-pressure flushing bioremediation dispersants	low-pressure flushing bioremediation dispersants	manual removal sorbents	sinking agents substrate removal high-pressure flushing vacuum/pumping manual cutting

3.5 Waste Management

It is fundamental that, as soon as an incident occurs, the right decisions are made and waste management contingency plans are activated. This will ensure a successful waste management operation and clean-up and will minimize costs. A useful reference document for oil spill waste management is the IPIECA Report Series Volume 12 "Guidelines for Oil Spill Waste Minimization and Management", available for free download at www.ipieca.org.

Objectives of waste management are:

- Safe handling, transportation and storage
- Prevention of secondary pollution
- Reduction in volume of waste
- Reuse of recovered oil
- Removal of waste from anywhere it could have an adverse effect on people or the natural environment

3.5.1 Waste Transport and Disposal

Small tankers or barges can be used for moving collected oil from the skimming vessels to the shore station. Watertight containers can be used on barges and lifted to shore using cranes. Pumps may also be used to transfer oil from tankers and barges, especially if holding tanks have been used, to containers on shore.

All wastes should be temporarily stored in containers, tanks, or lined dams until they can be transported to an approved waste disposal company. The Port Operator will have sufficient tanks and/or other storage that can be used to temporarily store clean-up wastes.

3.5.2 Wastes Generated by Different Oil Spill Response / Recovery Methods

Waste stream starts at point of generation, i.e. the spill site. Different environments and different clean-up techniques generate different types of waste. Table 3-5 shows the types of waste that can be generated by different types of response strategies.

Table 3-5 Response strategies and their effect on waste generation (IPIECA, 2004)

Clean-up technique		Effect on waste stream	Type of waste generated
Dispersant application 	Dispersant chemicals are used to break down the oil slick into small droplets so that the diluting effect of the ocean is better able to reduce hydrocarbon concentrations. This strategy will not work with all oils and is not appropriate for use in certain environments.	Waste concentrations are minimal as the oil is suspended in the water column and allowed to biodegrade naturally.	• No hydrocarbon waste is generated • PPE • Empty dispersant drums/considerations
At sea response operations 	Recovery devices, e.g. booms and skimmers, are deployed from ships or small craft to recover oil from the sea surface. Suitably sized storage systems may be needed which, in the case of highly viscous or waxy oils, will require heating elements. Transfer systems and reception facilities will also be needed to sustain operations over the long term.	Recovery operations will potentially give rise to a large quantity of waste oil and water for treatment. The volume of the storage systems available must be consistent with the recovery capacity of the skimmers. The type of oil spilled will have an effect on the resultant waste; viscous and waxy oils in particular will entrain debris and can create large volumes of waste. They can also present severe handling difficulties.	• Oiled equipment/vessels • Oiled PPE and workforce • Recovered oil • Oily water • Oiled vegetation • Oiled sorbent materials • Oiled flotsam and jetsam • Animal carcasses

Shoreline clean-up 	Oils are recovered from shorelines either using mechanical or manual means. Manual recovery is the preferred method because it has the effect of minimizing the amount of waste generated. Machines can be used to transport the waste from the shoreline to the primary storage site. Portable tanks or lined pits can be used to consolidate recovered oil at the operating site. The shoreline type, and degree of access to it, will dictate the types of strategies used which, in turn, will determine the amount of waste recovered.	The type of spilled oil will often have a profound effect on the amount of oily waste generated. Waste segregation and minimization techniques are critical to ensure an efficient operation. These should be established at the initial recovery site and maintained right through to the final disposal site otherwise waste volumes will spiral out of control. Waste sites should be managed in such a way as to prevent secondary pollution.	• Oiled equipment/vessels
			• Oiled PPE and workforce
			• Recovered oil
			• Oiled vegetation
			• Oily water
			• Oiled sorbent materials
			• Oiled beach material:
			  • sand
			  • shingle
			  • cobbles
			• Oiled flotsam and jetsam
			• Animal carcasses
			• Oiled transport

3.6 Wildlife Response

- Wildlife response requires a high level of training and is generally undertaken by DEC Officers with the assistance of a qualified veterinary surgeon.
- Wildlife response kits are held and maintained by DEC Officers in Karratha and at Exmouth (see Appendix A for contact details).

3.7 Sampling

- Samples of oil may be required to be collected to identify the source of spilled oil.
- CPM personnel shall not be involved in the taking of samples for prosecutions; this is generally done by the State authorities.
- If samples are taken for any other purpose they should be taken by trained personnel. Guidelines for this are provided in **Section 6.11**.

3.8 Termination of Response

3.8.1 Decision to Terminate

The decision to terminate the response shall be made by the Incident Controller in conjunction with the appropriate authorities. The authorities to be consulted are as follows:

- Tier 1 – State Hazard Management Agency (HMA) and WA Environment and Scientific Co-ordinator (ESC).
- Tier 2 & 3 - WA Marine Pollution Controller (MPC) or WA State Committee.

The decision to terminate the response will be dictated by several factors including:

- the continued effectiveness of the current clean up procedures;
- any potential for additional pollution;
- an assessment whether further clean up action will increase any environmental damage;
- whether the prevailing weather conditions will be effective in removing oil deposits.

3.8.2 Final Actions

Upon conclusion of the response, the following tasks shall be undertaken by the appropriate Emergency Control Coordinators under the direction of the Incident Controller:

- advise all relevant personnel and contractors
- advise all relevant government authorities
- prepare detailed reports and collate all documents including statements concerned with the incident
- undertake an inventory of consumables and prepare accounts for dissemination
- confirm that equipment has not been damaged in use
- arrange for the return of equipment to various locations from which it may have been dispatched
- conduct an investigation into the cause of the incident; and
- assess environmental monitoring requirements.

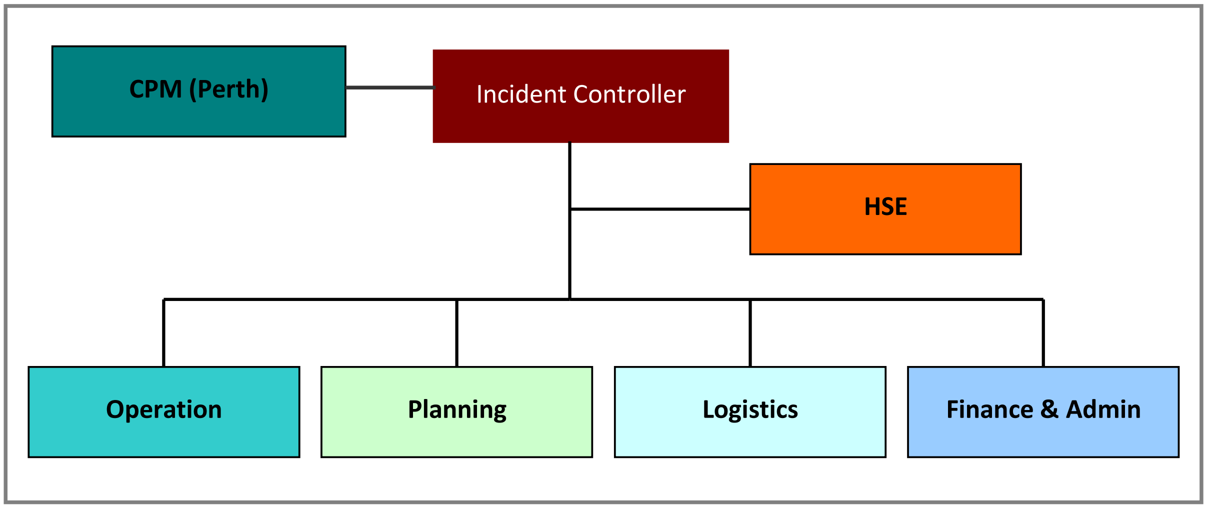
3.8.3 Debriefing

After each incident, for which a response was initiated, a debriefing shall be held by the Incident Controller. For small spills handled on site this shall be held by the Port Operator's nominated Incident Controller.

4 ORGANISATION & MANAGEMENT

The Oil Spill Response Incident Control System (OSRICS), consistent with the system used by the National Plan and Westplan-MOP will be adopted when forming the response team to an oil spill. The structure of the team is a leader (Incident Controller) supported by four main functional group or sections (see Figure 4-1). It should be noted that these functional groups represent roles and responsibilities, not individuals. Table 4-1 outlines the roles and responsibilities of the key functions of the OSRICS during an incident.

Figure 4-1 Structure of Emergency Centre



4.1 Standardization

By adopting this organizational framework, the Port Operator is establishing a standard for defining who is doing what, and how it should be done, during an oil spill emergency. Joint oil spill response operations with emergency response organizations will be easier. New personnel drafted in from elsewhere in the company or from another organization will take up their responsibilities more quickly and effectively.

4.2 Size and Scalability

Organizing the team along functional lines it makes it easy to scale up or down in size to meet the changing demands of the incident. For example during a small Tier 1 spill, one person may manage Planning and Operations with a team of three people to carry out clean-up activities. If the response becomes more complex or grows in size then the Planning function may need to be run separately with more staff brought in. In a serious spill involving a shoreline clean-up there may be hundreds of people to support and manage.

4.3 Specialist Support

The decision to send specialist support staff to join the response operations will be taken by the Incident Controller. The terms of reference and composition of the support team will depend on the particular circumstances of the incident and the Emergency Control Room (ECR) ability to access experts and resources locally.

Specialized support in handling major incidents and oil spills could include the following areas:

- Oil spill response expertise (e.g. spill behaviour, appropriate response, safety, logistics, resource deployment, waste disposal)
- Environmental advice (e.g. impacts of oil and response techniques on local flora & fauna, oil sampling, wildlife recovery and cleaning)
- Marine emergencies expertise (e.g. safety, cargo transfer, salvage, insurance)
- Legal expertise (e.g. claims and liabilities)
- Advice on cost control measures
- Media and public relations expertise
- Pollution claims – financial and administrative support.

Table 4-1 Emergency Control Room positions - key functions during an oil spill

Position	Key tasks and responsibilities
Port Operator	The Port Operator is responsible for collecting regular information and managing communication with: • Local press, radio and TV • National / International Media • Local communities and their representatives (NGOs) The Port Operator must be able at all times, to provide accurate, up to date summaries of the incident and status of the response.
Incident Controller	The Incident Controller is responsible for the overall management of the ECR organisation, which shall include all aspects of planning, organising, directing and controlling the emergency. These tasks will include coordinating resources (e.g. DPI personnel), issue of incident status reports, the recording of all incoming and outgoing information / intelligence and the monitoring of the levels of centre staff. The Incident Controller must ensure POLREP forms are sent to DPI OSRC for **ANY** spill size.
Planning Coordinator	The Planning Coordinator will carry out statutory reporting to the authorities. The Planning Coordinator is responsible for: • providing technical data and recommending response strategies • collecting, preparing and displaying information about the location of the oil spill and its movement. The Planning Coordinator reports to the Incident Controller.
Operation Coordinator	The Operation Coordinator is in charge of site security, and manages the ERT, personnel and contractors who are involved in on-site operations relating to the oil spill cleanup. The Operation Coordinator reports to the Emergency Team Leader and advises on strategies, progress of operations and resources needed.

Position	Key tasks and responsibilities
Logistics Coordinator	The Logistics Coordinator is responsible for providing response support needs in a timely manner. Support needs include food, shelter, protective clothing, transportation and response equipment, supplies and materials. The Logistics Coordinator reports to the Incident Controller.
Finance & Administration Coordinator	The Finance & Administration Coordinator is responsible for: • assisting all Coordinators with Human Resources issues • providing financial and administrative support • paying contractors and suppliers • the legal aspects of the oil spill response, including claims and insurance matters. The Finance & Administration Coordinator reports to the Incident Controller.
HSE Coordinator	The HSE Coordinator has specialist knowledge of HSE issues, and in particular environmental implications of the oil spill. The HSE Coordinator will provide advice on environmental sensitivities within the context of response strategies for the current emergency. The HSE Coordinator has specific responsibility for: • Monitoring the safety of all working practices • The custody of oil spill response equipment and rectification of any damage • Maintaining a list and training record of all on-site personnel trained in the use of oil spill equipment • Responsible for ensuring that routine maintenance of all oil spill response equipment is carried out to ensure operational readiness.
Emergency Response Team (ERT)	The functions of the ERT are primarily to deploy oil spill response equipment and carry out the formal clean-up at site. This may include boom deployments and skimmer operations. In addition, all members of the ERT must monitor safety at the spill site and report any issues to the On Scene Coordinator. The capability of the ERT depends on: • Flexible and scaleable organisation • Appropriate equipment in good working order • Competent and trained personnel

5 DATA

5.1 Oil Spill Response Equipment

This section outlines:

- Details of the oil spill response equipment held at Cape Preston; and
- Availability of equipment via the Westplan MOP and National Plan

5.1.1 Oil Spill Response Equipment at Cape Preston

Table 5-1 lists the inventory of oil spill response equipment (for Tier 1 response) to be held at Cape Preston.

Table 5-1 Equipment to be available at Cape Preston

Equipment No.	Description	Quantities
	Solid buoyancy booms	300m
	15 kg Anchor Kits (Danworth)	5
	Foilex skimmer	1
	Diesel Powered Spate Diaphragm Pump	1
	Collapsible Oil Recovery Tank 10,000 L	2 unit
	Work Boat suitable for deploying equipment	1
	Absorbent booms, pads and rolls	various
	PPE	various

5.1.2 National Plan Equipment

National stockpiles equipment is listed in the MOSES database and can be released by contacting AMSA or the WA DPI OSRC.

The estimated deployment time to Cape Preston is summarised in Table 5-2. These times may vary depending on the events at the time and are given for guidance purposes only.

Table 5-2 Estimated Response Time

From	Distance (km)	Sailing time	Flight time	Road Travel time
Dampier	70	3 hours	0.5 hours	1.5 hours
Barrow Island	85	4 hours	1 hour	-
Onslow	150	6 hours	1 hour	6 hours
Port Hedland	250	15 hours	1 hour	-
Exmouth	250	15 hours	1 hour	9 hours

5.2 Environmental Information

5.2.1 Climate and Metocean Conditions

Current and wind speed/direction are important factors that combine to influence the trajectory and fate of oil spilled on the sea surface and are thus crucial parameters to record and forecast during any spill response operation. Local environmental conditions are summarised in Table 5-3.

Weather conditions and predictions are available from the Duty Officer of the Bureau of Meteorology.

Table 5-3 Local Environmental Condition

Climate	Arid-subtropical climate with low, intermittent, annual rainfall (average 310 mm)	
Temperature	Summer	Average 34.8°C
	Winter	Average 25.6°C
Sea Temperature	Summer	29°C
	Winter	23°C
Bathymetry	Preston Island is located around 1.3 km north-west of Cape Preston and is separated from the mainland by shallow water (~1-2 mCD). The seabed is relatively shallow (<8 mCD) south-west of Preston Island, however, immediately north-west of Preston Island the seabed is 10 mCD and continues to deepen to around 25 mCD, 10 km to the north.	
Tides	Semi-diurnal with speed of up to 0.1-0.15 m/s during neap tides and up to 0.25 m/s during springs. Tidal speeds are predicted to increase on approach to the shallower water around Cape Preston and to reach 0.35 m/s through the major channels on either side of Cape Preston during springs.	
Currents	Tidal currents over the deeper offshore waters flood toward the south-east and ebb toward the north-west, but currents over the inshore waters are steered by the local bathymetry. Tidal currents off the delta of the Fortescue River have a predominantly east-west axis and tides off Preston Spit, on the western side of Cape Preston, shift east-west on approach to Preston Island. Surface current velocities during spring tides can reach 0.75 m/s (1.5 knots) whereas during neap tides the peak current velocities are typically 0.25 m/s (0.5 knots).	

Winds	In summer (September to February), winds are predominantly from the south-west during the morning (6-9 am), shifting westerly by mid-day and west to north-west during the afternoon and into the evening (3-6 pm). Winds during the other months are predominantly from the southeast to north-east throughout much of the day, but are predominantly from the west to north-west by early evening, except during June, which has more variable evening winds.
Cyclone	On average, 5 tropical cyclones pass through the West Australian region each year, although this will be variable on a year-to-year basis.

5.2.2 Environmental Sensitivities

Rocky shores make up approximately 40% of the shoreline habitats in the region with aspect and rock type varying with location. Rocky shorelines are found at the tip of Cape Preston, around most of Preston Island and close to the mouth of the nearby mangrove creek. This provides habitat to intertidal rocky shore organisms and a food source for shore birds.

Beaches at Cape Preston are relatively narrow with shallow intertidal mud flats. Beaches in the project vicinity are used, to a limited extent, as nesting grounds for marine turtles.

A well developed and structurally complex mangrove system is associated with the major tidal creek and connective tidal land that joins Cape Preston with the mainland. Other areas of mangal occur in the wider locality, including a generally narrow zone of *Avicennia marina* which borders the western shoreline and embayments between the creek and the mouth of the Fortescue River. The mangroves in the Cape Preston area are considered to be of high conservation value.

In the northern region of Cape Preston and on the western and northern sides of Preston Island contain coral reef structures with high coral cover (25 - 40%) and diversity. Associated with these reefs is a region of comparatively high coral cover and high species diversity on the western and northern side of Preston Island, approximately 100 m from the shore and approximately 100 m wide. An area of many hundreds of large *Goniastrea sp*. (hard corals) communities along approximately half the length of the north-eastern side of Cape Preston have been identified and are believed to be of regional significance.

Environmental sensitivities maps are included in Appendix D.

6 FORMS AND CHECKLISTS

6.1 POLREP Marine Pollution Report Form

Marine Pollution Report - POLREP		
Date of Incident		Time of Incident *(24hr format):*
Location Name / description:		
Latitude: ° ‘ ”	Longitude: ° ‘ ”	
Description of Incident:		
Pollution Source:		
Identity & Position of Adjacent Vessels (if source unknown):		
Cause of Discharge:		
Oil Type or Description:		
Amount of Pollutant (if known):		
Size of spill (length and width):		
Has Discharge stopped:	Yes / No / Unknown	
Movement & Speed of Pollution:		
Weather / Sea / Tide Condition:		
Statutory Agency:	Combat Agency:	
Initial Response Action:		
Samples Taken: Yes / No	Photographs/Video Taken: Yes / No	
Additional Information:		
Reported by:	Company:	
Phone:	Fax:	Mobile:

This form to be completed with as much of the above information as possible and **send to**:

Department of Planning and Infrastructure – Oil Spill Response Coordination Duty Officer:

Fax: (08) 9216 8982 or email: marine.pollution@dpi.wa.gov.au

FOR ANY ADDITIONAL INFORMATION PLEASE ADD EXTRA PAGES AS REQUIRED

6.2 SITREP Marine Pollution Situation Report

Marine Pollution Situation Report - SITREP							
Precedence	☐ Urgent ☐ Ordinary						
Final SITREP	☐ Yes ☐ No		Next SITREP:	: on / /			
Date/Time:							
Incident:							
Location:	Latitude:	° ‘ ”		Longitude:	° ‘ ”		
Report Prepared By:							
Agency:							
Phone:		Fax:		Mobile:			
Summary of event since last report (POLREP / SITREP):							
Expected developments:							
Areas threatened:							
Planned course of action:							
Details of assistance required:							
Other information							

This form to be completed with as much of the above information as possible and **faxed to**:

Department of Planning and Infrastructure – Oil Spill Response Coordination Duty Officer: (08) 9216 8982

FOR ANY ADDITIONAL INFORMATION PLEASE ADD EXTRA PAGES AS REQUIRED

6.3 Oil Spill Trajectory Modelling (OSTM) Request

CITIC PACIFIC MINING	**OIL SPILL TRAJECTORY MODELLING (OSTM) REQUEST**	**Send to AMSA to initiate request:** +61 2 6279 5076 (b/h) +61 2 6230 6868 (a/h) OSTM@amsa.gov.au **Confirmed by telephoning AMSA:** 1800 641 792 (24hr)

Priority of request Urgent ☐ Routine ☐ Exercise ☐

Vessel/spill/exercise name or identifier:

Name of requesting organisation	Name of requesting person and position in response

Contact telephone number	Email address for model output (preferred method)	Fax number for receipt of model output

Format of coordinates used (select one)	Latitude of spill	Longitude of spill
Degrees & decimal degrees	. °	. °
Degrees, minutes & decimal minutes	° ′ . ′	° ′ . ′
Degrees, minutes & seconds	° ′ ″	° ′ ″

Spill start date (e.g. 23 08 2000) Day Month Year	Spill start time (spill site local time, 24 hour clock)	Local time used *e.g. EST, WST, daylight saving etc*

Type of oil spilt or likely to be spilt *e.g.* Name: *crude oil* / Type*: fuel oil* / Grade*: bunker fuel*

Name	Type	Grade

Amount of oil spilt or likely to be spilt (complete one option)

If exact spill quantity is unknown for modelling purposes provide a maximum quantity of spill

☐ Tonnes ☐ Cubic metres ☐ Litres ☐ Barrels

Known or estimated amount of time oil was being discharged ☐ hours

How long do you want the model prediction for ☐ Hours (e.g. 12, 24, 36 hrs)

Surface water temperature at spill site ☐ °C (if not available AMSA will use an average for this location)

Wind speed and direction at spill location is vital to the effectiveness of the spill simulation. Provide observed winds preceding and following commencement of the spill and **FORWARD A COPY OF METEOROLOGICAL PREDICTIONS** with this form. **ANY UPDATES SHOULD BE FORWARDED AS THEY COME TO HAND**.

Notes	Time (24 hour local time)	Speed	Direction	Time (24 hour local time)	Speed	Direction
Give observed and predicted winds at regular steps (e.g. hourly, 3 -hourly) Wind direction should be given as the direction the wind is coming from **Important: specify speed units**						

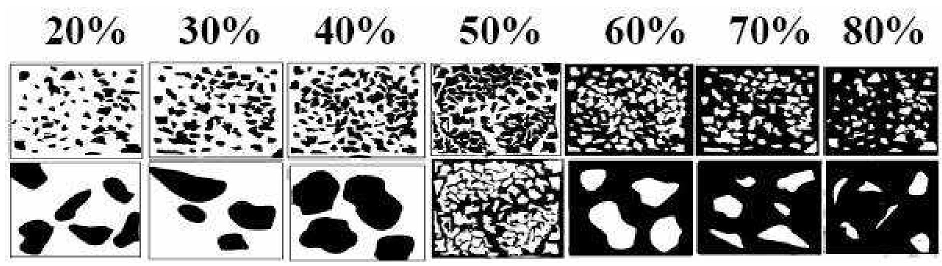
Units for wind speed (tick one box): knots ☐ km/hr ☐ m/s ☐

6.4 Slick Observation Report

AERIAL OBSERVATION REPORT			
Use this report to send update information to the spill modellers (AMSA)			
Incident		**Ref. No.**	
Date	_______ /_______ / ________	**Time**	______ : _____ **(24 hr)**
Attachments		**No of Pages**	

From:				
	Observer's Name		**Position**	
	Aircraft		**Pilot Name**	

Area/ Region			Time:	___ : ___ (24 hr)		
Slick Position	Latitude		Longitude			
	Other					
Slick Description	Slick Length	m	Slick Width	m	Area	km^2
	Percentage Cover by thickness (using colour as a guide)		Clean Surface	%		
			Silver Sheen	%		
			Rainbow/ Iridescence	%		
			Dull Colours	%		
			Dark Brown/Black	%		
			Light Brown (Emulsion)	%		
	Other Description/ Notes e.g. patchy, continuous, windrows					
Movement/ Behaviour/ Consistency						
Visibility	Weather		Cloud Cover/ Height			
Other Notes						

Dimension	Length and width of pollution in kilometres
Area cover %	Use the Figure below to assess the percentage of the boxed dimensioned area (length x width), covered with pollution: 
Oiled area	Oiled area covered with pollution, calculated by multiplying length, width and cover % Example: Length x Width x Cover% 2km x 1 km x 50%, gives Oiled area = 1 km^2
Oil appearance coverage	Allocation of percentage of the 'Oiled Area' to the Appearance of the pollution. Example: ½ cover – rainbow - Column 2 = 50% ¼ cover – Metallic - Column 3 = 25% ¼ cover – True Colour - Column 5 = 25%
Minimum volume	Minimum Quantity of Oil Pollution in cubic metres. Calculated as follows: [Oiled area] x [Appearance Code Minimum Thickness Value] x [Decimal Percentage of Appearance] [1 km^2] x [0.3 m^3/km] x [0.50] = 0.15 m^3 [1 km^2] x [5.0 m^3/km] x [0.25] = 1.25 m^3 [1 km^2] x [200 m^3/km] x [0.25] = 50 m^3 Minimum Total Quantity = 0.15 + 1.25 + 50 = 51.4 m^3
Maximum Volume	Maximum Quantity of Oil Pollution in cubic metres. Calculated as follows: [Oiled area] x [Appearance Code Maximum Thickness Value] x [Decimal Percentage of Appearance] [1 km^2] x [5.0 m^3/km] x [0.50] = 2.5 m^3 [1 km^2] x [50 m^3/km] x [0.25] = 12.5 m^3 [1 km^2] x [>200 m^3/km] x [0.25] = >50 m^3 Minimum Total Quantity = 2.5 + 12.5 + >50 = >65 m^3

6.5 Personal Log

PERSONAL LOG				
Incident		Date		
Name		Role		
Time Started or Occurred	Time Completed	Record of Own Decisions and Actions		

6.6 Dispersant Application Form

CITIC PACIFIC MINING	**DISPERSANT APPLICATION REQUEST FORM**	Sought approval from State Environment and Scientific Coordinator: 1300 784 782 (DEC 24hr contact) 08 9480 9924 (DPI 24hr contact)

Incident:		Ref. No:	
Date:		Time:	(24hr)

Spill	Initial date/ time of spill:	
	Latitude: ° ‘ ”	Longitude: ° ‘ ”
	Oil Type: Diesel / HFO/ Other	API Gravity:
	Pour point	Estimate Volume (bbls/m^3)
	Flowrate if Continuous Flow	
	Estimated Water Surface Cover Km^2	

On Scene Weather & Water Condition	AIR temperature	WATER TEMPERATURE
	weather ☐Clear ☐Rain ☐Partly Cloudy ☐Overcast ☐Fog	
	Current Speed Knots / $km.h^{-1}$	Direction (from)
	Wind speed Knots / $km.h^{-1}$	Direction (from)
	Sea State	Wave Height metres
	Water depth metres	Visibility Nm
	Other consideration	

Proposed Dispersant Plan	Name of dispersant proposed for use:	
	Total Amount of Dispersant to be Used:	
	Time of Dispersant Application	Date: Time:
	Estimated % of Spill Area to be Treated	
	Reason for requesting dispersant use:	
	Location of The Area to be Treated Relative to the Following (See page 2)	

Signature of Requester	
Printed name of requester	
Title/position of Requester	
Company / Affiliation	

DISPERSANT APPLICATION REQUEST FORM
Page 2 / 2 Attach Chart and mark the following on the chart: • Slick / trajectory • Proposed dispersant zone • Threatened resources

6.7 Status Update: Environmental Resources at Risk Form

STATUS UPDATE: ENVIRONMENTAL RESOURCES AT RISK			
Incident:		**Ref. No:**	
Date:		**Time:**	*(24HR)*

Segment/Location	**Sensitive Resources/Area**	**Priority**	
		Protection	**Cleanup**

Other Details

6.8 Guide to Incident Response Team Briefings

Objectives
• Share the latest information – make everyone aware of the current situation
• Set priorities
• Explain the response strategy
• Initiate the response action plan
• Monitor the effectiveness of the response and identify problem areas and solutions
Briefings
The On Scene Coordinator outlines the purpose of the briefing, and uses the briefing to: ❑ Specify hazards and safety issues ❑ Describe oil spill – location, size, oil type, source (use sketches, map, photos) ❑ Predict movement of the oil ❑ Identify response strategies and prioritise areas for oil spill intervention ❑ Describe the overall 'action plan' to tackle the problems and to reduce risks ❑ Allocate tasks to named individuals, and specify times for the completion of each ❑ Outline weather forecast for next operational period ❑ Review communications (are they working? what frequencies? are key people contactable?)
Each member of the team then briefly reports on: ❑ Important events since last briefing ❑ Actions taken / achievements / problems remaining ❑ Resource requirements: equipment and personnel for next operational period ❑ Plan for next operational period
On Scene Coordinator ensures everyone understands the response priorities and safety procedures
On Scene Coordinator ends the briefing by giving the time and place of the next briefing

6.9 Emergency Control Room Checklist

Below is a checklist of items that should be kept ready in the Emergency Control Room ready for the Emergency Control Coordinators (ECCs) to use if they are mobilised.

Emergency Control Room - documents and resources	
Communications	
❑	Dedicated telephones (maintain some private lines for outgoing calls)
❑	Mobile telephones (if network is available), spare batteries, battery chargers
❑	Fax machines (at least one dedicated to incoming faxes only)
❑	Computers linked to the computer network (for event logging, e-mail, Internet, intranet)
❑	Telephone message recording system
Information	
❑	Cape Preston Port Oil Spill Contingency Plan – this document
❑	Cape Preston Port Emergency Response Plan
❑	Westplan MOP
❑	General map of all operations showing CPM operations, including environmental sensitivities
❑	Personal log books
❑	Situation report (SITREP) board
❑	Status boards to record deployment of equipment, personnel, aircraft, etc
Facilities	
❑	Dedicated conference room with large central table, cupboards and wall mounted status boards, maps and whiteboards
❑	Separate reception centre for visitors
Support Equipment	
❑	Photocopier
❑	Laptop computers, software and printers
❑	Overhead projector
❑	Stationery
❑	Photocopying whiteboard and/or flipcharts

6.10 Equipment Checklist – Emergency Response Team

The Emergency Response Team should ensure they and other personnel involved in the response have the following standard safety equipment and clothing:

Description	Quantity
Oil spill response safety:	
Long sleeved coveralls	
Non-slip safety boots or sea boots	
Hardhat (when any overhead risk)	
Work gloves	
Life vest (worn when deploying boom, working on a boat or near water)	
Ear defenders (in vicinity of power packs or pumps)	
Goggles (in vicinity of hydraulic connectors)	
Radio (for team leader)	
Sun cream	
Working close to freshly spilled oil:	
Gas detector	
For manual recovery of oil:	
Chemical resistant gloves	
H_2S Face mask	

6.11 Sampling Guideline

Task	Action			Status
1	Establish reason for sampling and obtain any specific sampling, sample handling requirements or equipment requirements from the receiving laboratory. In particular:			
	a	Number of replicate samples.		
	b	Type of container.		
	c	Volume of sample needed.		
	d	Cooling needs and time needed to get to laboratory.		
2	Sampling from the surface of water:			
	a	Thin films:		
		i	Use sorbent discs/pads made from glass wool, Teflon (PTFE) wool or stainless steel gauze.	
		ii	Applied lightly to the water surface and then placed inside an airtight container (see 5) for transport to the laboratory.	
		ii	The use of synthetic sorbents is not recommended. If used send a clean sample of the sorbent to the laboratory also.	
	b	Thick slicks:		
		i	In the absence of specialised equipment, collect using clean buckets, dustpans and wide-necked jars.	
3	Sampling from solid surfaces:			
	a	Viscous oils and tarballs can be scraped off surfaces using clean steel or wooden spatulas or spoons, and placed into sample containers.		
	b	Oil adhering to sediment, seaweed, small pieces of wood, plastic materials or other debris may be collected by placing the oil and substrate material, into the sample container.		
	c	Note: Oil samples should not be taken by washing oil from surfaces and no attempt should be made to heat or melt samples taken from solid surfaces so as to enable them to flow into a container.		
4	Sampling from wildlife:			
	a	Cut oiled feathers or fur and place in containers.		
	b	Cut un-oiled feathers or fur and send for analysis also.		
	c	Avoid taking samples from specimens that have been stored in plastic containers.		
5	Place each sample into a container:			
	a	Clean glass jars (250-500 ml) with wide mouth should be used		
	b	Caps of the glass jars or bottles should be lined with either metal foil or be made of Teflon (PTFE).		
6	Label each sample container with:			
	a	Identification code or sample number.		
	b	Date and time of sampling.		
	c	Brief description of sample and collection point location.		
	d	Name of person taking sample (and witness).		

Task	Action			Status
7	Complete and attach a Chain of Custody label to each jar. This should contain the information on the label (see 6) and also:			
	a	Signature and printed name of person who collected the sample.		
	b	Signature and printed name of person who witnesses the sample collection.		
	c	Chain of Custody record, i.e. repeated sequence of:		
		i	Sample handed/sent to.	
		ii	Signature.	
		iii	Date.	
		iv	Sample received by.	
		v	Signature.	
		vi	Date.	
8	Separately record the following information on a Sample Record:			
	a	Identification code or sample number.		
	b	Date and time of sampling.		
	c	Description of sample.		
	d	Accurate location from which sample was taken.		
	e	Name, organisation and address of person collecting the sample.		
	f	Name, organisation and address of independent person witnessing sample collection.		
	g	Sample ownership (for who was it collected).		
	h	Method of sampling (describing any special technique or equipment used).		
	i	Particulars of any photographs taken.		
	j	Other relevant information e.g.:		
	k	i	suspected source.	
	l	ii	suspected contamination of the sample i.e. have detergents been used and if known their type and make.	
	m	Chain of Custody record (see 7 above).		
9	Send copy of the sample record to the laboratory.			
10	Store sample:			
	a	In refrigerators or cold rooms (at not more than 5 ^{o}C) and in the dark.		
	b	Ensure that room is secure or else place sample bottles/jars in containers with tamper proof seals.		
	c	For samples that may be stored for more than 24 hrs: To prevent biological degradation of wet samples, the addition of 1 ml of 50% hydrochloric acid per litre of water samples is recommended. Additionally, displacement of air from the container with nitrogen or carbon dioxide can help to prevent degradation of the sample.		
	d	Ensure sufficient space has been allowed in the container for any expansion of the sample that might occur.		
11	Transport samples safely. Contact aerial carrier for specific conditions.			

7 BACKGROUND

Mineralogy Pty Ltd obtained Ministerial approval for the construction and operation of the Sino Iron Project (the Project) Port in 2003. The Project, a large-scale magnetite iron ore project located at Cape Preston, 100km south west of Karratha in Western Australia Pilbara Region (Figure 7-1 and Figure 7-2),was approved under the conditions within Statement 635, which included the requirement for further assessment of the Port via several Environmental Management Plans.

In 2006, CITIC Pacific Mining (CPM) purchased the rights for the Project from Mineralogy Pty Ltd via the Sino Iron takeover agreement. As part of this agreement CPM will manage the development of the ore-body and port, and will function as the Project Manager, while Mineralogy will remain the Proponent for the Project.

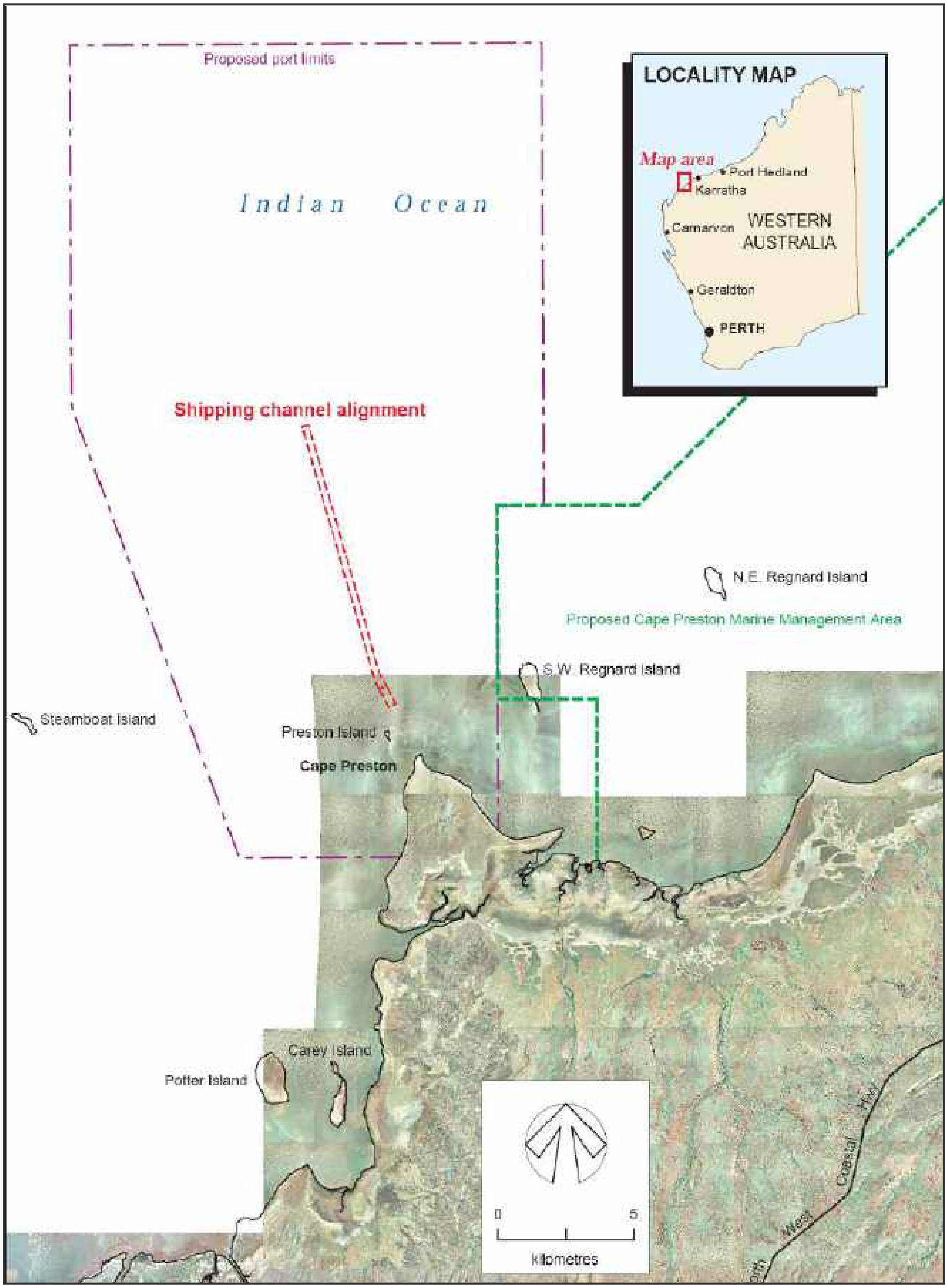
Figure 7-1 Location of the Sino Iron Project

The Sino Iron's project infrastructures in Cape Preston include

- Processing infrastructure, such as:
  - Primary crushers
  - Autogenous and Semi-Autogenous grinding mills
  - Concentrator
  - Pellet plant
- Supporting infrastructure, such as:
  - Port facilities
  - Combined cycle gas-fired power station

- Accommodation villages
- Desalination plant
- Materials handling equipment including a slurry pipeline

Figure 7-2 Cape Preston port limit area



7.1 Objective of the Plan

This OSCP provides a procedural response to oil spill incidents in the marine environment within Project Port limits at Cape Preston. The objectives of the OSCP are to:

- Ensure an adequate response capability appropriate to the level of risk, to minimise environmental impacts for clean-up operations
- Minimise the effects on the environment from any oil spill incidents occurring within the port
- Establish a basis for co-ordination between port management, State Government and other relevant authorities; and
- Ensure the port has the capability and is prepared to control and mitigate an oil spill incident.

7.2 Legislative Requirements

This OSCP has been prepared in compliance with Condition 9-1 (Item 4) of Statement 635 for the project, and is consistent with Department of Industry and Resources OSCP (2008) guidelines.

The Western Australia Department for Planning and Infrastructure (DPI) is the Hazard Management Agency (HMA) for oil spills in WA State waters under the *Emergency Management Act 2005*.

DPI also has statutory responsibility to respond to spills of oil from vessels under the *Pollution of Waters by Oil and Noxious Substances Act 1987*.

7.3 Interfaces with Other Contingency Plans

This OSCP is integrated with and/or supported by the following plans:

7.3.1 National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances

National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances (National Plan) is a plan agreed to by the Commonwealth and state/territory government and the oil, shipping and exploration industries to provide a response capability to the threat posed to the coastal environment by marine oil and chemical spills. It is administered nationally by the Australian Maritime Safety Authority (AMSA).

7.3.2 Western Australian Marine Oil Pollution Emergency Management Plan

Supporting the National Plan for WA is the Western Australian Marine Oil Pollution Emergency Management Plan (Westplan MOP). The State Marine Pollution Committee administers this plan. The Westplan-MOP details the arrangements between State government agencies and industry to combat marine oil pollution within Western Australia. It prescribes responsibilities and procedures, and provides a basis for coordination of resources in responding to oil spill events.

The Westplan MOP provides guidance in the appropriate response mechanisms for minimising the effects of pollution incidents upon the States marine environment through the following:

- Describes the responsibilities and procedures for the prevention and preparation for, and response to, marine oil pollution emergencies;

- Establishes a basis for coordination between State Government agencies and industries involved in the manufacture, storage, use and/or transport of oil or other petroleum products;
- Provides the basis for planning for marine oil pollution and other marine emergencies at the regional and local level;
- Provides an interface with AMSA for the request and coordination of interstate and overseas assistance; and

7.3.3 Emergency Response Plan

This OSCP complements the Port Emergency Response Plan (ERP), which details procedures in the event of an accident or emergency situation. The ERP shall be referred to for any spills of hazardous materials or for spills accompanied by other emergencies

7.4 Division of Responsibility

Designated Hazard Management Agencies (HMAs) and Combat Agencies (CAs) for oil pollution are listed in Table 7-1.

Response to spills within private port limits is the responsibility of the relevant Company. As such, a spill occurring within the limits of the port and its operational area will be the responsibility of CPM.

Table 7-1 Hazard Management Agencies and Combat Agencies for Various Spill Incident

Location or jurisdiction of spill	Spill Source	HMA	Combat Agency	
			Tier 1	Tier 2/3
Commonwealth Water(1)	Vessels	AMSA	Company(4)	AMSA
State Water(2)	Vessels	DPI(3)	Company(4)	DPI
	Other/Not known	DPI(3)	DPI	DPI
Private Port	Any	DPI(3)	Company(5)	DPI

(1) Commonwealth Waters extend from 3nm from baseline.
(2) State (or Coastal) Waters extend out from the baseline for a distance of 3nm. They also include “Internal Waters”, enclosed bays and declared ports.
(3) Prescribed HMA under the *Emergency Management Act 2005*
(4) Owner of the vessel or cargo spilled
(5) Company responsible for the spill or Company operating facility (e.g. berth) at which the spill occurred.

8 TRAINING AND EXERCISES

8.1 Training

It is expected that all potential response personnel will maintain adequate levels of training to ensure oil spill preparedness. Proper training of response personnel can reduce encourages up-to-date planning for the control of, and response to, an oil spill, and also helps to sharpen operating and response skills, introduces the latest ideas and techniques, and promotes familiarity with this OSCP.

The minimum training recommended for potential response personnel are outlined in Table 8-1.

Table 8-1 Minimum training requirements

Role	Minimum training	Frequency
Incident Controller and Emergency Control Coordinators	Oil spill management course which shall include but not limited to: • The strategies, techniques and organisation for oil spill response • Planning for and management of an oil spill response • The operational and environmental factors that affect an oil spill response • The operation and hands-on deployment of equipment • The organisational arrangements that apply in Australia, involving Government and industry bodies	Every 2-3 years
Emergency Response Team	Training or course with particular emphasis on the practical aspects of equipment handling.	Every 12-18 months

8.2 Exercises and Drills

In addition to training, the Port Operator will hold drill/exercise program which is comprised of tabletop and deployment exercises at least once a year to ensure oil spill preparedness.

9 TERMINOLOGY

Term	Definition
AMSA	Australian Maritime Safety Authority
BAOAC	Bonn Agreement Oil Appearance Code
bbls	Barrels
Combat Agency	An organisation with expertise and resources that has responsibility for performing a task or activity, such as fire fighting, dealing with chemical spills, rescue, etc.
CPM	CITIC Pacific Mining Pty Ltd
Cst	Centistokes (Cst) is a measure for dynamic viscosity.
DEC	Department of Environment and Conservation
DPI	Department of Planning and Infrastructure
ECC	Emergency Control Coordinators
ECR	Emergency Control Room
ERP	Emergency Response Plan
ERT	Emergency Response Team
FESA	Fire and Emergency Service Authority
Hazard Management Agency	The agency prescribed in the regulations to the *Emergency Management Act 2005* as being responsible for ensuring that all activities are undertaken for the prevention of, preparedness for, response to and recovery from a specific emergency. DPI is so prescribed in respect of Marine Oil Pollution emergencies.
HFO	Heavy Fuel Oil
HMA	Hazard Management Agency
IPIECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owners Pollution Federation
National Plan	National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances
NGO	Non Governmental Organisation

Term	Definition
OSC	On Scene Coordinator
OSCP	Oil Spill Contingency Plan
OSRC	Oil Spill Response Coordinator
OSRICS	Oil Spill Response Incident Control System
OSTM	Oil Spill Trajectory Modelling
POLREP	Marine Pollution Report
SITREP	Marine Pollution Situation Report
Statutory Agency	A term used in the National Marine Oil Spill Contingency Plan to describe an agency, which has authority and responsibility as defined under a government Act.
Westplan MOP	Western Australian Marine Oil Pollution Emergency Management Plan

APPENDIX A CONTACT DIRECTORY

A.1 Port Operator Key Contacts

Name / Position	Role	Contact Details
	Incident Controller	
	On Scene Commander	
	Planning Coordinator	
	Operation Coordinator	
	Logistic Coordinator	
	Finance & Administration Coordinator	

A.2 National Response Agency

Agency	Role	Contact Details
AUSSAR Rescue Coordination Centre		
Aviation		1800 815 257 - 24 hr
Maritime	Call for: Aerial Dispersant Spray mobilisation & Oil Spill Trajectory modeling	1800 641 792 - 24 hr
AMSA – Maritime Operations		
Duty Officer (via RCC)		1300 555 555 - 24 hr
GM Maritime Operations	Commonwealth Marine Pollution Controller	1800 641 792 - 24 hr
Manager Environment Protection Group		(02) 6269 0843 - 24 hr
Civil Aviation Safety Authority		(02) 6269 0800 - 24 hr
Australian Customs Service	Coastwatch, Canberra	131757 - 24 hr
Bureau of Meteorology	Coastal Weather Forecasts	1800 06 1800 - 24 hr
Royal Flying Doctor Service	Medical emergencies	(08) 9263 2258 - 24 hr

A.3 State Response Agencies

Agency	Role	Contact Details
Department of Planning and Infrastructure (DPI)	HMA for marine oil spill in State and Inland Waters. Vessels and technical support to FESA for chemical spills in State Waters.	Oil pollution (reporting) 24 hours a day seven days a week (08) 9480 9924
	For approval of chemical dispersant use	Oil Spill Response Coordination Team Duty Officer – (08) 9480 9924
Department of Environment and Conservation (DEC)	Management of impacts on wildlife	Karratha Regional Manager - Ph (08) 9182 2000 or 0428 441 118 Exmouth District Manager - Ph (08) 9947 8000.
Fire and Emergency Services Authority (FESA)	HMA, through FRS, for spills of hazardous materials (e.g., chemical spills).	Perth (08) 9323 9300 Karratha (08) 9143 1227 or 1800 631 227 (Western Australia only)
Department of Fisheries (DoF)	Notice of pollution incidents	Perth (08) 9482 7333 Karratha (08) 9144 4337
Local Government Authorities.	Assist with Tier 2 or Tier 3 marine oil pollution response.	Karratha (08) 9144 4337
Department of Health	Advise required of marine pollution alert	Shire of Roebourne (08) 9186 8555
Department of Mines and Petroleum	Provide local advice on areas threatened by pollution.	Karratha (08) 9143 2346
WA Police	Assist with liaison between Incident Controller and local communities.	Perth (08) 9222 3333 Karratha (08) 9186 8888
Port Authorities	Provide an expert response teams for marine operations. First Response Agency for spills within District but outside Port limits.	Karratha (08) 9144 2233 Dampier (08) 9159 6555 Emergency: 0428 888 800
WorkSafe	Provision of Coordinator and staff for OH&S Unit	WorkSafe - 1300 30 78 77 (for callers within Western Australia only)
Australian Government Analytical Laboratories (AGAL)	Fingerprinting of oils; Measurement of oil in water or oil in sediments; Oil weathering analysis	Canberra (02) 6213 6075
Dampier Port Authority		(08) 9159 6565 Bus Hrs
Port Hedland Port Authority		(08) 9173 1400 Bus Hrs
State Emergency Services Pilbara		(08) 9173 2333 Bus Hrs

APPENDIX B EQUIPMENT LIST

B.1 Dampier

Equipment Number	Description	Quantities
ANC112590	ROULUNDS RO-BAY BOOM REPAIR KIT #5	1
PDHA185	Boom Self Inflating "Versatech Zooom 12/18"	460 m
PDIA204	Boom Beach "Shore Guardian"	200 m
PDGA171	Boom Inflatable "Sea Sentinel"	300 m
PDFA149	Boom Self Buoyant "Gamlen Trojan"	100 m
PDJ12505	BOOM SWEEP INFLATABLE NOFI V	
PAG12507	WINCH BOOM RECOVERY NOFI V SWEEP	
PDI10937	BOOM BEACH STRUCTURFLEX LAND SEA	300 m
PDGA176	Boom "Vikoma Coastal Pack" 300m	300
PDFA160	Boom Self Buoyant "Gamlen Trojan"	125 m
PDO106341	ANCHOR KIT SMALL 15KG SET OF 5	1
PDO10970	ANCHOR KIT LARGE 100KG SET OF 6	
PDO10789	ANCHOR KIT SMALL 15KG SET OF 3	
PDH4203	BOOM SELF INFLATING VERSATECH ZOOM 12/18	300 m
PDG9688	BOOM INFLATABLE ROULUNDS RO BAY 1500	600 m
PDIA209	Boom Beach "Shore Guardian"	200 m
PDF109441	BOOM SELF BUOYANT STRUCTURFLEX GP	300 m
PDDA137	Skimmer - Rope Mop "PWS 9-T"	
PDCA124	Skimmer - Disc "Komara 12K"	
PDAA093	Skimmer - Weir "Vikoma Dragonfly"	
PDA4898	SKIMMER WEIR GT185	
PDAA097	Skimmer - Weir "Dragonfly"	
PDAA096	Skimmer - Weir "Delta Head" DP 008	
PDCA131	Skimmer - Disc "Komara 12K"	
PDA105385	SKIMMER WEIR FOILEX	
SH105348	SKIMMER HEAD WEIR FOILEX	1
PAL12515	PUMP SKIMMER SYSTEM SPATE	
PBDA058	Tank - Oil "Fastank" 2000 lt	
PBD10726	TANK RECOVERED OIL FLEXIDAM 10000LT	
PBD10725	TANK RECOVERED OIL FLEXIDAM 10000LT	
PBDA062	Tank - Oil 56000 lt	
PBDA061	Tank - Oil 36000 lt	
PBDA060	Tank - Oil "Towable Bag" 20000 lt	
PBDA059	Tank - Oil "Flexi-tank"	
PBD4900	TANK RECOVERED OIL COLLAPSIBLE TRANSPAC 2.6T	
PBD4899	TANK RECOVERED OIL COLLAPSIBLE TRANSPAC 2.6T	

Equipment Number	Description	Quantities
PBDA081	Tank - Oil "Fastank" 9000 lt	
PBDA080	Tank - Oil "Fastank" 9000 lt	
PBD105307	TANK RECOVERED OIL TOWABLE CANFLEX 10T	
PALA021	Spray Unit Vessel Mounted Vikospray	
PALA035	Spray Unit Vessel Mounted Vikospray	
PALA036	Spray Unit Vessel Mounted Vikospray	
PDKA222	Spray Bucket Dispersant Helicopter "Simplex 6810"	
PAL12209D	PUMP DISPERSANT TRANSFER FIXED WING	
PDK4237	SPRAY BUCKET DISPERSANT HELICOPTER SIMPLEX	
MOF108272	Oiled Wild life Response Kits	
BP111800	ONGA WATER PUMP WITH HONDA ENGINE	1
BP111801	ONGA WATER PUMP WITH HONDA ENGINE	1
IP111785	STIHL BR420 BACKPACK BLOWER	1
IP111784	STIHL BR420 BACKPACK BLOWER	1
VCA11963	TRAILER BOX TANDEM AXLE	
VCA10492	TRAILER TRIPLE AXLE MARCO	
WCF10490	VESSEL OIL RECOVERY MARCO COWRIE	
PAN106369	MOTOR OUTBOARD HONDA 4 STROKE 90HP	1
PAN106368	MOTOR OUTBOARD HONDA 4 STROKE 90HP	1

B.2 Barrow Island

Equipment Number	Description	Quantities
PDHA112581	Zoom Boom 12/18	100M
PDI110341	BOOM BEACH STRUCTURFLEX LAND SEA	80 M
PDIA112582	Tidal Beach Boom	50m
PDHA191	Boom Self Inflating "Versatech Zooom 12/20"	200 m
PDJA213	Boom Towed "Jackson Net"	500m
PDBA112584	Brush Skimmer 12T	1
PBDA112583	Collapsible Bund	1
AB1208031	Absorbent boom	500m
PBD12080311	Tank oil canflex 5500L	
PBDA074	Tank - Oil "Fol-Da-Tank" portable frame 5500 lt	
VCAA278	Trailer - Oil Spill	
PBDA112585	Liner Sheet 16m x 16m and 20m x 20m	1 each

B.3 Onslow

Equipment Number	Description	Quantities
PBD106300	TANK RECOVERED OIL FLEXIDAM 10000LT	
PBD106301	TANK RECOVERED OIL FLEXIDAM 10000LT	
PDF106025	BOOM SELF BUOYANT STRUCTURFLEX GP	195 m

Equipment Number	Description	Quantities
PDA105383	SKIMMER WEIR FOILEX	
SH105346	SKIMMER HEAD WEIR FOILEX	1
PAL12513	PUMP SKIMMER SYSTEM SPATE	
PDO106342	ANCHOR KIT SMALL 15KG SET OF 5	1
PDI106024	BOOM BEACH STRUCTURFLEX LAND SEA	180 m

B.4 Port Hedland

Equipment Number	Description	Quantities
PDO10972	ANCHOR KIT SMALL 15KG SET OF 5	1
PBD11978	TANK RECOVERED OIL FLEXIDAM 10000LT	
PDA105386	SKIMMER WEIR FOILEX	
PDI12490	BOOM BEACH STRUCTURFLEX LAND SEA	40M
PAL4467	PUMP DISPERSANT SYSTEM WSL	
PDH4396	BOOM SELF INFLATING VERSATECH ZOOM 12/18	300 m
PAL4470	PUMP DISPERSANT SYSTEM WSL	
PAL4469	PUMP DISPERSANT SYSTEM WSL	
PAL4466	PUMP DISPERSANT SYSTEM WSL	
PDCA110342	Skimmer Disc Komara 12K Mk2	
PDCA122	Skimmer Disc Komara 12K Mk2	
PDIA111145	BOOM BEACH STRUCTURFLEX LAND SEA	100M
PDI11635	BOOM BEACH STRUCTURFLEX LAND SEA	160 m
SH105349	SKIMMER HEAD WEIR FOILEX	1
PBD11977	TANK RECOVERED OIL FLEXIDAM 10000LT	
PAL12516	PUMP SKIMMER SYSTEM SPATE	
PDF4204	BOOM SELF BUOYANT AUST POL D2	300 m

B.5 Exmouth

Equipment Number	Description	Quantities
PBD106299	TANK RECOVERED OIL FLEXIDAM 10000LT	
112560	Vikoma 12K disc Skimmer	1
112562	Beach Guardian Boom	20
112564	Anchor Kit 27kg	4
112567	Helicopter Spray bucket	1
112565	Storage Bin 70lt	2
112563	Fast tank	1
112561	Zoom Boom	25m
112559	Ropemop 240	
PDF106021	BOOM SELF BUOYANT STRUCTURFLEX GP	300 m
PBD106298	TANK RECOVERED OIL FLEXIDAM 10000LT	
112558	Shoreline Boom	300m

APPENDIX C MODELLING RESULTS

C.1 Purpose

Oil spill modelling was commissioned by CPM to quantify the exposure risk to surrounding areas should a spill of a specified type and volume of hydrocarbon was to occur. A stochastic (or randomized) sampling approach was used to predict the probability of where an oil spill may impact for defined time periods. The modelling results allow the determination of which waters and shorelines are most at risks during various seasons.

The aim of this section is to present the modelling results along with the appropriate response strategies for each of the identified scenario.

C.2 Model Limitation

It should be noted that the probability contours in each of these figures do not represent the potential extent of any single spill.

- In the event of a spill, prevailing weather condition should be used to predict where the oil may move.
- A trajectory modelling may be requested from AMSA to predict the movement of oils during an actual spill event based on specific circumstances such as volume spilled, real-time weather condition, etc.

C.3 Appendix Structure

Section	Scenario	Page No
Section C4	500 L Diesel spill inside the Breakwater	C-2
Section C5	10 Tonnes HFO spill inside the Breakwater	C-5
Section C6	10 Tonnes HFO spill at the jetty	C-10
Section C7	500 Tonnes HFO spill at the jetty	C-15
Section C8	10 Tonnes HFO spill at the Transhipper	C-23
Section C9	100 Tonnes HFO spill at the Transhipper	C-27
Section C10	5000 Litres Diesel spill at the Transhipper	C-34
Section C11	100,000 Litres Diesel spill at the Transhipper	C-39

C.4 500 L Diesel spill inside the Breakwater

Modelling results indicate that:

- The spill will spread radially within a few hundred metres from the spill source.
- There is a 1% chance of the slicks reaching Preston Island within an hour of a spill occurring. However, Preston Island is not considered an environmentally sensitive area.

Behaviour:

- Diesel slicks will spread rapidly and forms rainbow and silver sheen within a few hours.
- Evaporation is generally rapid, especially if there is a high wind. Normally it will be difficult to see any remaining diesel in the water 24 hours after the spill.
- The environmental impacts resulting from a 500 litres diesel spill are likely to be very localised.

Recommended Response Strategy

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Generally, a spill of diesel is not dangerous and disperses within 24 hours. Given the size of the spill, it may be best to just monitor it and to let it evaporate;

Physical Break up:

- If the diesel is collecting in areas of still water, try to break and disperse it using the water cannon or propeller wash;
- The northern region of Cape Preston and on the western and northern sides of Preston Island contains coral reef structure. Consider the potential effects of temporarily higher concentrations of oil in the water column on coral reefs before using this technique.

Containment and Recovery:

- 'Containment and recovery' strategy is not likely to be needed for a 500 litres diesel spill as it will usually evaporate and disperse very quickly leaving hardly any oil on the surface for responders to recover.

Shoreline Protection

- Use water cannon to deflect spills from the shore/breakwater area and Preston Island if required;
- Use sorbent booms (or sorbent snares) to protect the shore/breakwater area and Preston Island if required;

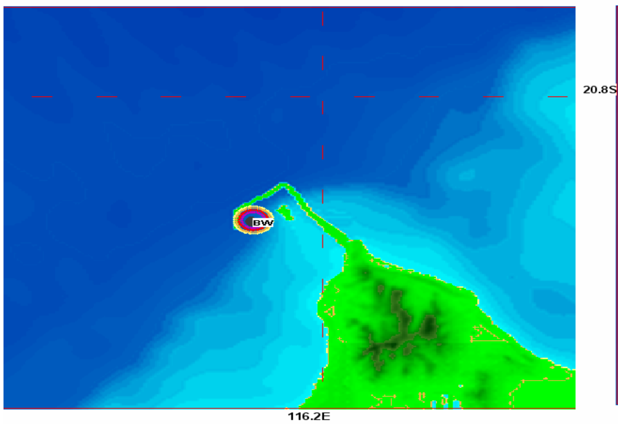
Do not use dispersant

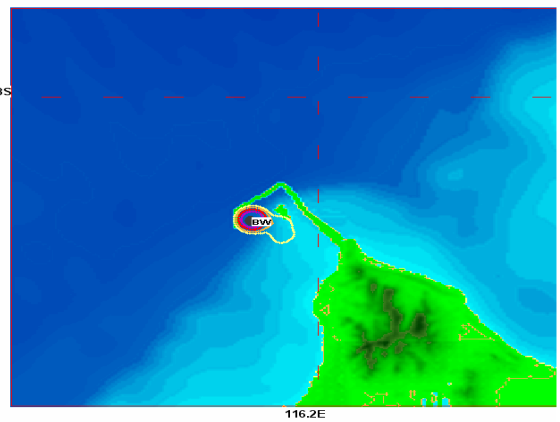
Shoreline Cleanup

- Diesel oil is not very sticky or viscous, compared to black oils. Although the oil tends to penetrate porous sediments quickly, it also tends to be washed off quickly by waves and tidal flushing. Thus, shoreline cleanup is usually not needed. However, monitoring of oily shorelines will be required.

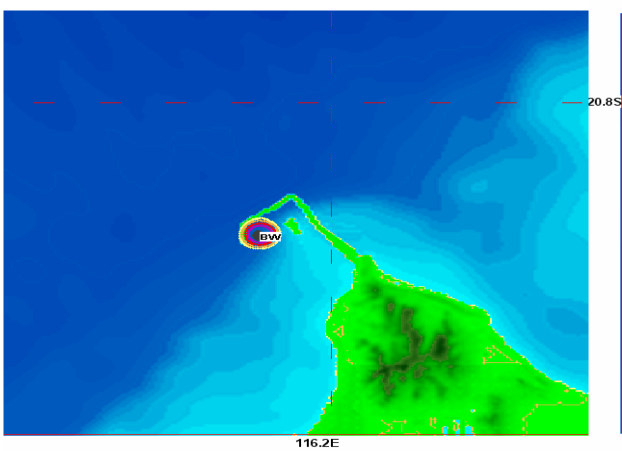
Trajectory Plot for a 500 litre Marine Diesel Spill inside Breakwater at Cape Preston

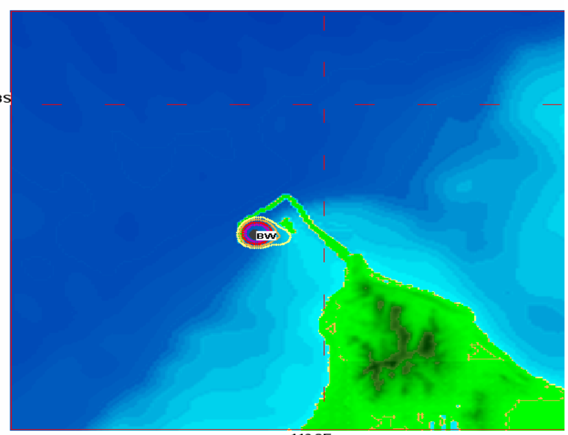
- January to February, after 1 (left) and 3 hours (right)



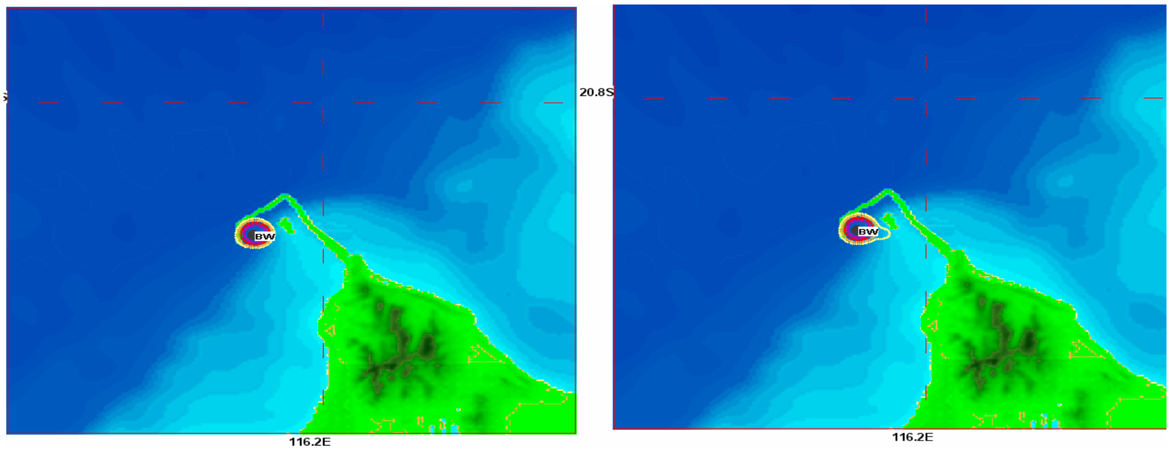


- March to May, after 1 (left) and 3 hours (right)

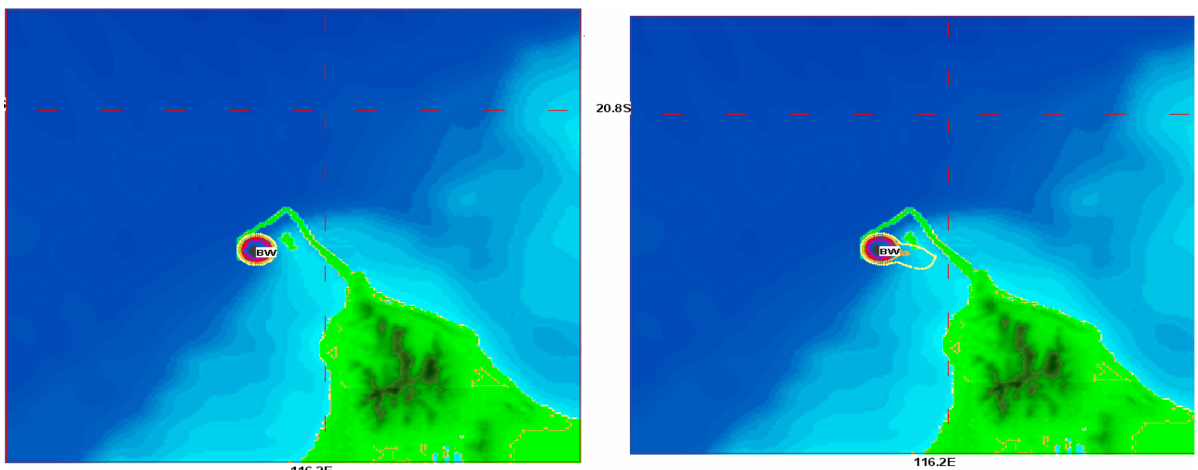




- June to July, after 1 (left) and 3 hours (right)



- August to December, after 1 (left) and 3 hours



Contour	1	2	5	10	25	50

C.5 10 Tonnes HFO spill inside the Breakwater

This is likely to be a spill that requires resources beyond the Port Operator's capability and therefore a Tier 2/3 spill response will be required.

The key initial response actions by the Port Operator shall be:

- Stop and contain the spill
- Report and communicate with the relevant agencies and escalate as required
- Mobilise Port and ECC resources and equipment as soon as possible to prevent escalation of the spill

Modelling results indicate that:

- The spill is likely to impact Preston Island and the causeway.
- The bulk of the spilled HFO will be confined to less than 1 km from the original spill source.

Behaviour:

- HFO are high density and when spilled on water spread into thick, dark coloured slicks
- Under certain conditions, it is possible for HFO slicks to submerge beneath the sea surface
- In high sediment areas (rivers, beaches) HFO could potentially sink once it picks up sediment, resulting in subsurface tarballs or tarmats
- HFO tend to be less toxic than crude oils and some other refined products, however strong adhesive properties and persistence may cause greater impact on fauna
- Because of its high viscosity, beached HFO tends to remain on the surface rather than penetrate sediments. Light accumulations usually form a "bathtub ring" at the high-tide line; heavy accumulations can pool on the beach.

Recommended Response Strategy (initial response with Port Operator resources and equipment)

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Monitor and evaluate spill constantly. Assumed worst case until better data is available:
  - It may be hard to assess spilled HFO from the air because the oil is not floating on the surface (see 'Behaviour').
  - When oil is visible on surface, it may not be possible to assess thickness of oil patches and therefore quantity of oil spilled.
- If required, request shall be made immediately to run a computer model to predict spread, weathering and movement of the oil spill.
- Given the location of the spill and the persistency of HFO, letting natural processes (evaporation and dispersion, etc) to take place is **NOT** an option.

DO NOT Attempt Physical Break up:

- Heavy Fuel Oils tend to emulsify if mixing energy is applied;

Containment and Recovery:

- Secure the spillage and deploy booms and skimmers to contain the spillage and to minimise the risk of mobilisation of oils into environmentally or aesthetically sensitive environment:
  - See 'containment and recovery' decision guide (Figure 3-1) before deploying booms;
  - Containment boom can be used to encircle or otherwise entrap floating oil so it can be accumulated and recovered at the spill location - a grounded barge, a vessel at anchor or at dockside.
  - For a spill in calm weather, with minimal current movement (<0.75 knots) oil may be contained by stretching a boom across a waterway perpendicular to the path of the spill.
  - Entrainment or loss of oil under the boom begins to occur when a boom is placed perpendicular to a current > 0.75 knots. Adjust the boom angle depending on the current strength.
- Recover oil:
  - Because HFO does not spread as liquid oil would, skimmers have an inherent difficulty maintaining sufficient feed.
  - Rope Mop skimmer may be used to recover HFO.
- The success of a recovery operation depends on adequate offshore and onshore facilities for storing the recovered oil and oily water. The logistics of storage and transfer of recovered oil needs to be planned by the ECC team;
  - Pumping into and out of on-board temporary storage will be much more difficult than with lighter oils.
  - Storage tanks may require heating to make transfer operations much more efficient.
- Manual methods of recovery are slower than using equipment but may be equally effective:
  - Given its viscosity, low-tech recovery methods, e.g. mechanical grabs, are likely to be more efficient than sophisticated skim-and-pump techniques.
  - Sorbent materials, buckets, rakes, shovels, plastic sacks and appropriate protective clothing can also be used;
  - Do not overfill containers, as they will have to be carried safely out of the spill area;
  - Lay sorbents pads or sheets on walkways to prevent pollution being trodden into uncontaminated areas;
  - Look after the needs of clean-up personnel, as the work is labour intensive, dirty, tiring, boring and possibly dangerous;

Shoreline Protection

- Use sorbent booms (or sorbent snares) to protect the shore/breakwater area and the island(s) if required;
- Use booms to intercept, deflect, or move a slick towards a more desirable recovery site if necessary:

– Readjust angles and widths between boom sections as necessary to meet changing conditions (tides, currents, and winds);

– Constant monitoring of system efficiency is required.

DO NOT Use Dispersant

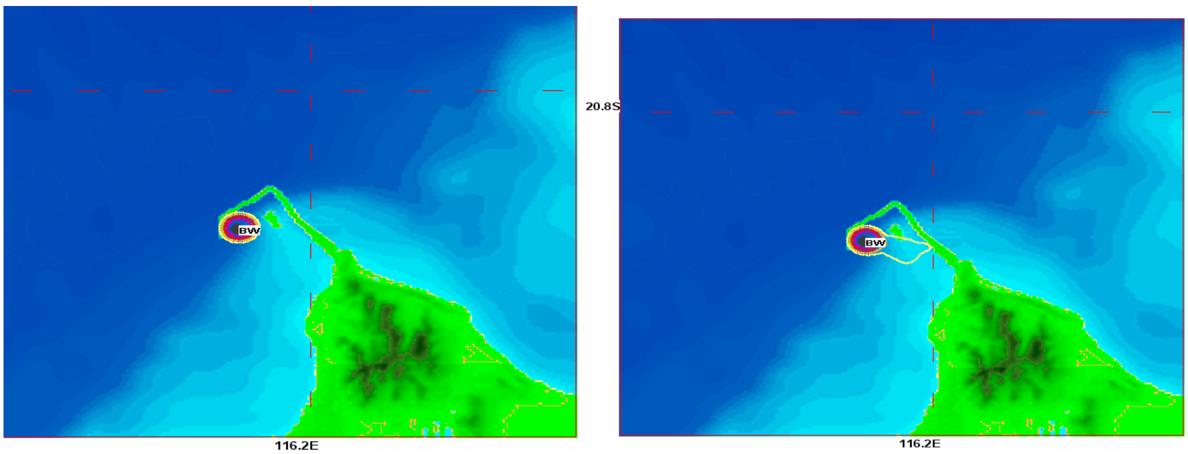
Shoreline Clean Up

- Approximately 40% of the shoreline habitats in the area are made up of rocky shore:
  – Rocky shore is ranked as having *low sensitivity* based on the high-energy environment that usually present.
  – Highly viscous oil tends to attach itself firmly to hard surfaces, making clean-up difficult on rocky shores. However, when the oil has emulsified with water it may not adhere so readily.
  – Use suction device to remove pooled oil in gullies, rockpools and between boulders. Consider the environmental advantages of the method against the damage caused by trampling.
  – Use low pressure flushing with ambient temperature seawater. Oil needs to be held within a containment boom and picked up with skimmers before it can oil other shores.
  – Use sorbent to remove liquid oils in small areas like rockpools.
  – Use manual recovery such as forks and shovels to clean up oiled seaweed and tarballs
- Port facilities:
  – Port structures are considered as having *low sensitivity* and clean-up operation shall aim to return the port as quickly as possible to normal operations and to minimise the risk of mobilisation of oil into environmentally sensitive location.
  – Force out oil trapped under port structure by using ships propellers or fire house. Oil needs to be held within a containment boom and picked up with skimmers before it can oil other shores.
  – Remove oil stranded on shorelines and facilities by manually scrapping or wiping with rags or hot and cold water pressure cleaners.
  – Consider ventilation, headroom and accessibility for clean-up personnel in the semi-enclosed structure under the port structures.
- Sandy beaches:
  – Penetration into sandy beaches is likely to be minimal, thus removal of HFO from beaches with hard-packed sand is normally straightforward. Care must be taken if mechanical diggers are used so as not to mix oil with sand.
  – Fine-grained sand beaches are classified as having *mid level sensitivity* as they are relatively easy to clean, because the beach is usually able to support heavy equipment such as road graders and penetration into the beach is limited to about 15 cm or less. Fine-grained sand beaches may be used as 'sacrificial beach'.
  – Sensitivity increases as grain size increases to gravel and cobble-sized material, because oil can penetrate very deeply into the beach, making cleanup extremely difficult.
  – Clean up of oil on coarse sands and gravels usually needs very intrusive physical processes, such as high-volume flushing. Oil flushed out then must be collected, for example with sorbents.

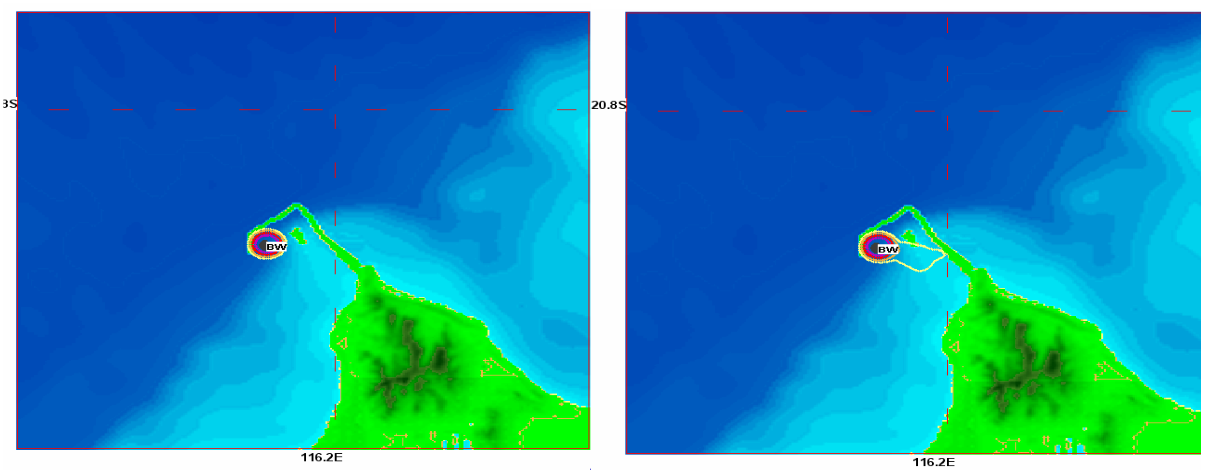
- Beaches at Cape Preston are relatively narrow with shallow intertidal mud flats:
  - Exposed tidal flats are ranked as having *moderately high sensitivity* because of the potential biological activity susceptible to oil spill damage.
  - Tidal flat are generally hard to access, therefore cleanup efforts maybe limited.

Trajectory Plot for a 10 tonne Marine Heavy Fuel Oil Spill inside Breakwater at Cape Preston

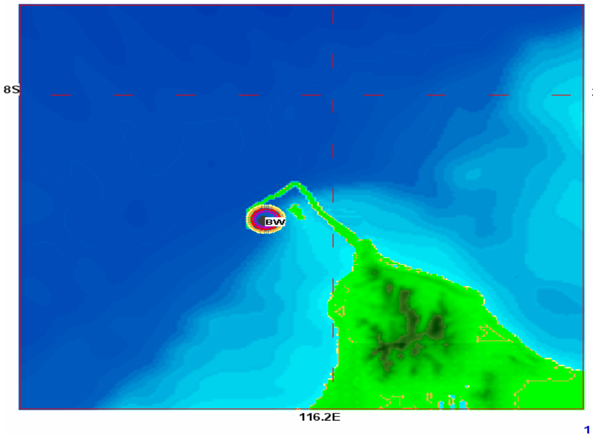
- January to February, after 1 hour (left) and 3 hours (right)

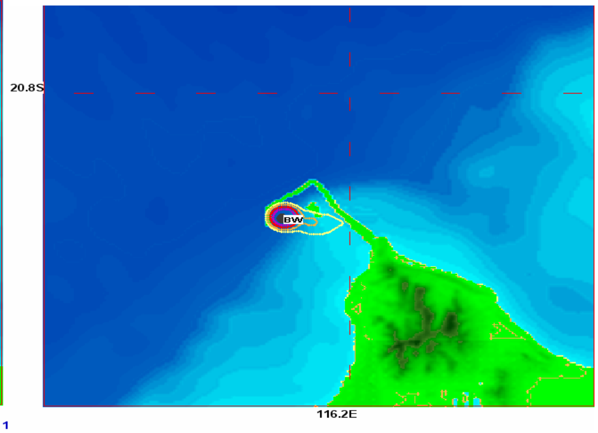


- March to May, after 1 hour (left) and 3 hours (right)

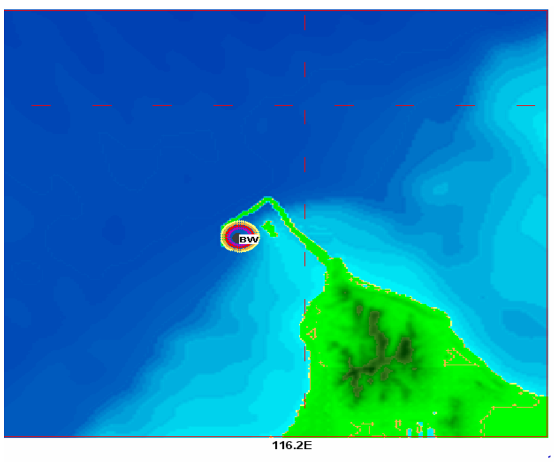


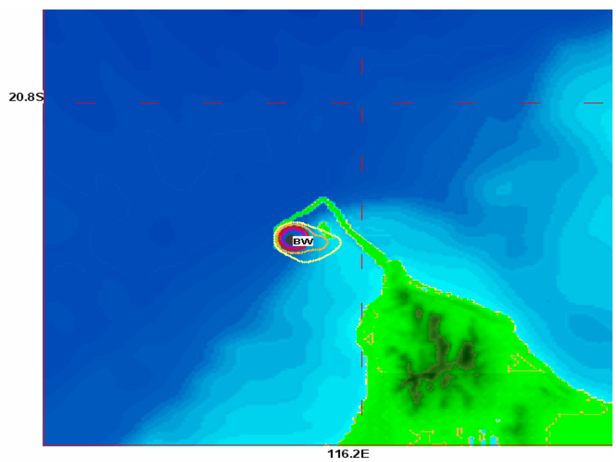
- June to July, after 1 hour (left) and 3 hours (right)





- August to December, after 1 hour (left) and 3 hours (right)





Contour	1	2	5	10	25	50

C.6 10 Tonnes HFO spill at the Jetty

This is likely to be a spill that requires resources beyond the Port Operator's capability and therefore a Tier 2/3 spill response will be required.

The key initial response actions by the Port Operator shall be:

- Stop and contain the spill
- Report and communicate with the relevant agencies and escalate as required
- Mobilise Port and ECC resources and equipment as soon as possible to prevent escalation of the spill

Modelling results indicate that:

- The spill is likely to travel as far as 5km within the first 12 hours and impact South West Regnard Island to the east of Cape Preston.
- The spill is likely to travel as far as 20km within 24hours and impact other islands around Cape Preston

Behaviour:

- HFO are high density and when spilled on water spread into thick, dark coloured slicks
- Under certain conditions, it is possible for HFO slicks to submerge beneath the sea surface
- In high sediment areas (rivers, beaches) HFO could potentially sink once it picks up sediment, resulting in subsurface tarballs or tarmats
- HFO tend to be less toxic than crude oils and some other refined products, however strong adhesive properties and persistence may cause greater impact on fauna
- Because of its high viscosity, beached HFO tends to remain on the surface rather than penetrate sediments. Light accumulations usually form a "bathtub ring" at the high-tide line; heavy accumulations can pool on the beach.

Recommended Response Strategy (initial response with Port Operator resources and equipment)

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Monitor and evaluate spill constantly. Assumed worst case until better data is available:
  - It may be hard to assess spilled HFO from the air because the oil is not floating on the surface (see 'Fate').
  - When oil is visible on surface, it may not be possible to assess thickness of oil patches and therefore quantity of oil spilled.
- If required, request shall be made immediately to run a computer model to predict spread, weathering and movement of the oil spill.

- Given the location of the spill and the persistency of Heavy Fuel Oil, letting natural processes (evaporation and dispersion, etc) to take place is NOT an option.

DO NOT Attempt Physical Break up:

- HFO tend to emulsify if mixing energy is applied;

Containment and Recovery:

- Secure the spillage and deploy booms and skimmers to contain the spillage and to minimise the risk of mobilisation of oils into environmentally or aesthetically sensitive environment:
  - Containment boom can also be used to encircle or otherwise entrap floating oil so it can be accumulated and recovered at the spill location - a grounded barge, a vessel at anchor or at dockside.
  - See 'containment and recovery' decision guide (Figure 3-1) before deploying booms;
  - Simple spill in calm weather along with minimal current movement (<0.75 knots) can be contained by stretching a boom across a waterway perpendicular to the path of the spill.
- Recover oil:
  - Because HFO does not spread as liquid oil would, skimmers have an inherent difficulty maintaining sufficient feed.
  - Rope Mop skimmer may be used to recover HFO.
- The success of a recovery operation depends on adequate offshore and onshore facilities for storing the recovered oil and oily water. The logistics of storage and transfer of recovered oil needs to be planned by the ECC team;
  - Pumping into and out of on-board temporary storage will be much more difficult than with lighter oils.
  - Storage tanks may require heating to make transfer operations much more efficient.
- Manual methods of recovery are slower than using equipment but may be equally effective:
  - Given its viscousity, low-tech recovery methods, e.g. mechanical grabs, are likely to be more efficient than sophisticated skim-and-pump techniques.
  - Sorbent materials, buckets, rakes, shovels, plastic sacks and appropriate protective clothing can also be used;
  - Do not overfill containers, as they will have to be carried safely out of the spill area;
  - Lay sorbents pads or sheets on walkways to prevent pollution being trodden into uncontaminated areas;
  - Look after the needs of clean-up personnel, as the work is labour intensive, dirty, tiring, boring and possibly dangerous;
- Use booms along the shoreline to divert oil to areas which are less sensitive where it can be collected. For example, to prevent it from entering channels in mudflat systems, area with coral reefs, etc.

Shoreline Protection

- Use sorbent booms (or sorbent snares) to protect the shore/breakwater area and the island(s) if required;

- Use booms to intercept, deflect, or move a slick towards a more desirable recovery site if necessary:
  - Readjust angles and widths between boom sections as necessary to meet changing conditions (tides, currents, and winds);
  - Constant monitoring of system efficiency is required.

Do Not Use Dispersant

Shoreline Clean Up

- Approximately 40% of the shoreline habitats in the area are made up of rocky shore:
  - Rocky shore is ranked as having low sensitivity based on the high-energy environment that usually present.
  - Highly viscous oil tends to attach itself firmly to hard surfaces, making clean-up difficult on rocky shores. However, when the oil has emulsified with water it may not adhere so readily.
  - Use suction device to remove pooled oil in gullies, rockpools and between boulders. Consider the environmental advantages of the method against the damage caused by trampling.
  - Use low pressure flushing with ambient temperature seawater. Oil needs to be held within a containment boom and picked up with skimmers before it can oil other shores.
  - Use sorbent to remove liquid oils in small areas like rockpools.
  - Use manual recovery such as forks and shovels to clean up oiled seaweed and tarballs
- Port facilities:
  - Port structures are considered as having low sensitivity and clean-up operation shall aim to return the port as quickly as possible to normal operations and to minimise the risk of mobilisation of oil into environmentally sensitive location.
  - Force out oil trapped under port structure by using ships propellers or fire house. Oil needs to be held within a containment boom and picked up with skimmers before it can oil other shores.
  - Remove oil stranded on shorelines and facilities by manually scrapping or wiping with rags or hot and cold water pressure cleaners.
  - Consider ventilation, headroom and accessibility for clean-up personnel in the semi-enclosed structure under the port structures.
- Sandy beaches:
  - Penetration into sandy beaches is likely to be minimal, thus removal of HFO from beaches with hard-packed sand is normally straightforward. Care must be taken if mechanical diggers are used so as not to mix oil with sand.
  - Fine-grained sand beaches are classified as having mid level sensitivity as they are relatively easy to clean, because the beach is usually able to support heavy equipment such as road graders and penetration into the beach is limited to about 15 cm or less. Fine-grained sand beaches may be used as ‘sacrificial beach’.
  - Sensitivity increases as grain size increases to gravel and cobble-sized material, because oil can penetrate very deeply into the beach, making cleanup extremely difficult.

– Clean up of oil on coarse sands and gravels usually needs very intrusive physical processes, such as high-volume flushing. Oil flushed out then must be collected, for example with sorbents.

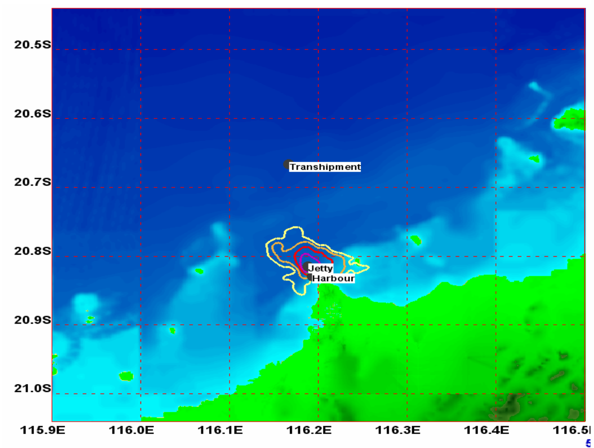
- Beaches at Cape Preston are relatively narrow with shallow intertidal mud flats:

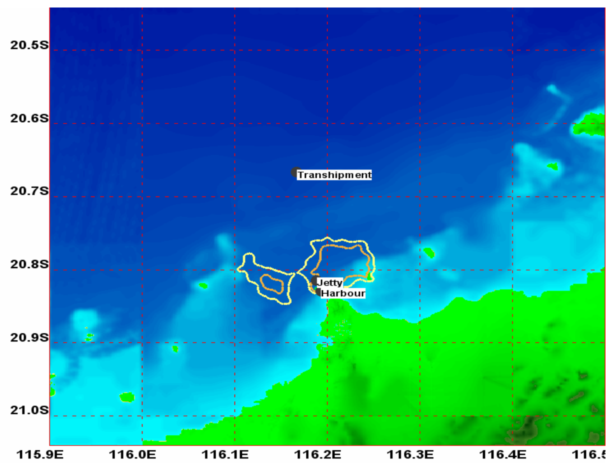
  – Exposed tidal flats are ranked as having moderately high sensitivity because of the potential biological activity susceptible to oil spill damage.

  – Tidal flat are generally hard to access, therefore cleanup efforts maybe limited.

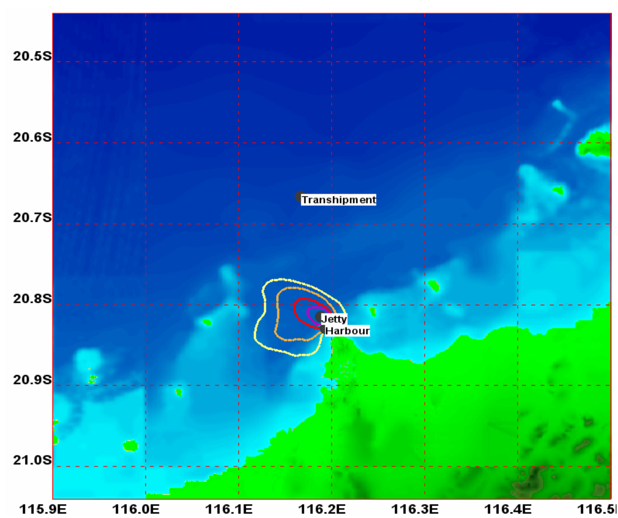
Trajectory Plot for a 10 tonne Marine Heavy Fuel Oil Spill at the Jetty at Cape Preston

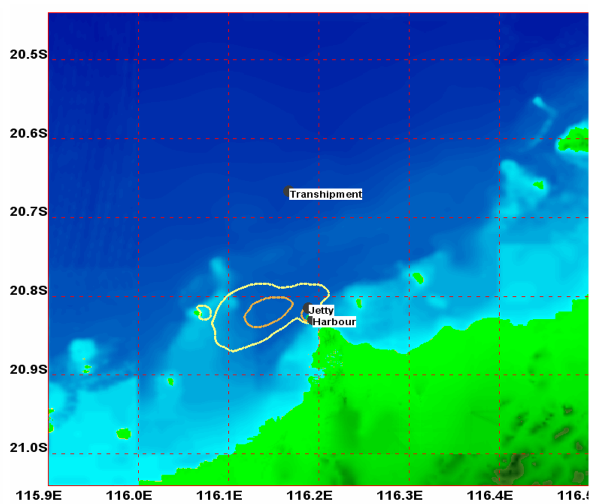
- January to February after 12 and 24 hours



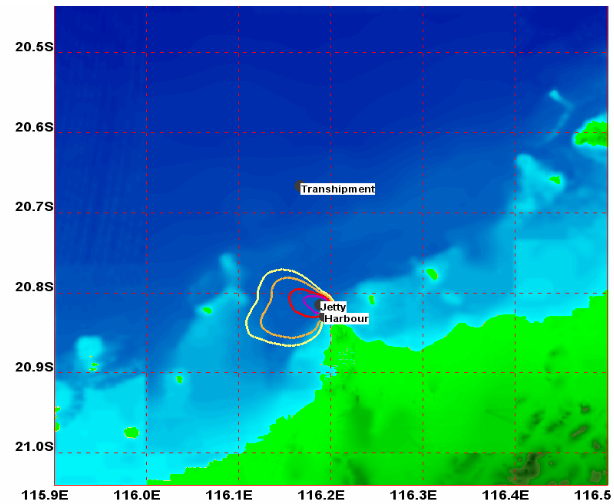


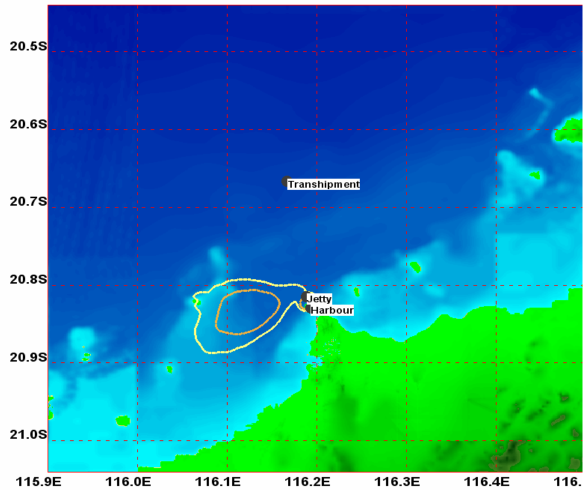
- March to May after 12 and 24 hours



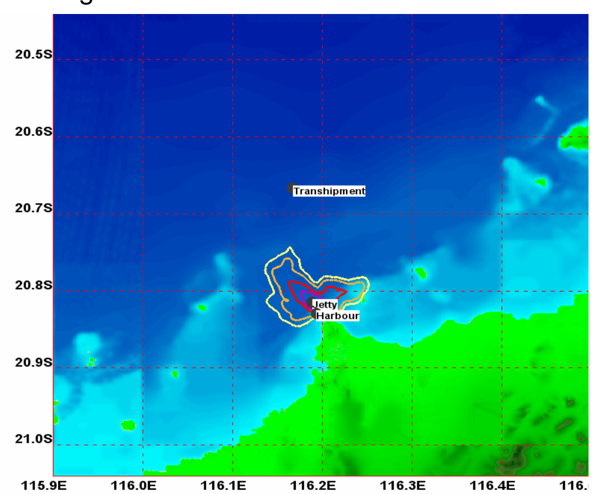


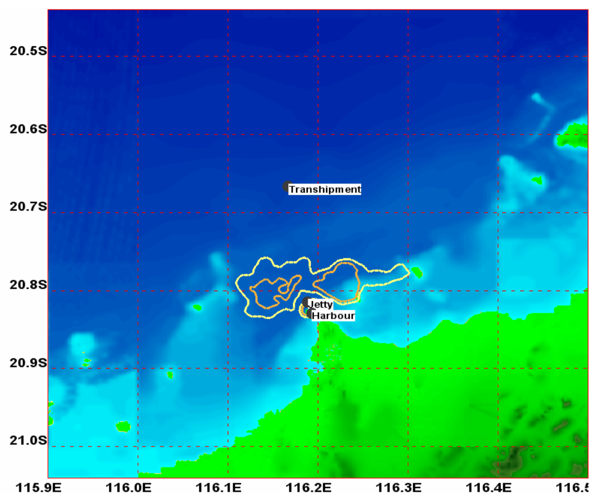
- June to July after 12 and 24 hours





- August to December after 12 and 24 hours





Contour	1	2	5	10	25	50

C.7 500 Tonnes HFO spill at the Jetty

This is likely to be a spill that requires resources beyond the Port Operator's capability and therefore a Tier 2/3 spill response will be required.

The key initial response actions by the Port Operator shall be:

- Stop and contain the spill
- Report and communicate with the relevant agencies and escalate as required
- Mobilise Port and ECC resources and equipment as soon as possible to prevent escalation of the spill

Modelling results indicate that:

- The spill spreads rapidly, primarily in an offshore direction and may spread up to 10 km within 12 hours including contact with South West Regnard Island to the east.
- Within 72 hours, the spill may travel up to 20km and impact other islands around Cape Preston.
- The slick tends to move east during January-February and August-December periods. During March – July period however, the tendency is for the spill to move west.

Behaviour:

- HFO are high density and when spilled on water spread into thick, dark coloured slicks
- Under certain conditions, it is possible for HFO slicks to submerge beneath the sea surface
- In high sediment areas (rivers, beaches) HFO could potentially sink once it picks up sediment, resulting in subsurface tarballs or tarmats
- HFO tend to be less toxic than crude oils and some other refined products, however strong adhesive properties and persistence may cause greater impact on fauna
- Because of its high viscosity, beached HFO tends to remain on the surface rather than penetrate sediments. Light accumulations usually form a "bathtub ring" at the high-tide line; heavy accumulations can pool on the beach.

Recommended Response Strategy (initial response with Port Operator resources and equipment)

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Monitor and evaluate spill constantly. Assumed worst case until better data is available:
  - It may be hard to assess spilled HFO from the air because the oil is not floating on the surface (see 'Behaviour').
  - When oil is visible on surface, it may not be possible to assess thickness of oil patches and therefore quantity of oil spilled.

- If required, request shall be made immediately to run a computer model to predict spread, weathering and movement of the oil spill.
- Given the location of the spill and the persistency of HFO, letting natural processes (evaporation and dispersion, etc) to take place is **NOT** an option.

DO NOT Attempt Physical Break up:

- HFO tend to emulsify if mixing energy is applied;

Containment and Recovery:

- Secure the spillage and deploy booms and skimmers to contain the spillage and to minimise the risk of mobilisation of oils into environmentally or aesthetically sensitive environment:
  - See 'containment and recovery' decision guide (Figure 3-1) before deploying booms;
  - Containment boom can be used to encircle or otherwise entrap floating oil so it can be accumulated and recovered at the spill location - a grounded barge, a vessel at anchor or at dockside.
  - For a spill in calm weather with minimal current movement (<0.75 knots), oil may be contained by stretching a boom across a waterway perpendicular to the path of the spill.
  - Entrainment or loss of oil under the boom begins to occur when a boom is placed perpendicular to a current > 0.75 knots. Adjust the boom angle depending on the current strength.
- Recover oil:
  - Because HFO does not spread as liquid oil would, skimmers have an inherent difficulty maintaining sufficient feed.
  - Rope Mop skimmer may be used to recover HFO.
- The success of a recovery operation depends on adequate offshore and onshore facilities for storing the recovered oil and oily water. The logistics of storage and transfer of recovered oil needs to be planned by the ECC team;
  - Pumping into and out of on-board temporary storage will be much more difficult than with lighter oils.
  - Storage tanks may require heating to make transfer operations much more efficient.
- Manual methods of recovery are slower than using equipment but may be equally effective:
  - Given its viscosity, low-tech recovery methods, e.g. mechanical grabs, are likely to be more efficient than sophisticated skim-and-pump techniques.
  - Sorbent materials, buckets, rakes, shovels, plastic sacks and appropriate protective clothing can also be used;
  - Do not overfill containers, as they will have to be carried safely out of the spill area;
  - Lay sorbents pads or sheets on walkways to prevent pollution being trodden into uncontaminated areas;
  - Look after the needs of clean-up personnel, as the work is labour intensive, dirty, tiring, boring and possibly dangerous;

Shoreline Protection

- Use sorbent booms (or sorbent snares) to protect the shore/breakwater area and the island(s) if required;
- Use booms to intercept, deflect, or move a slick towards a more desirable recovery site if necessary:
  - Readjust angles and widths between boom sections as necessary to meet changing conditions (tides, currents, and winds);
  - Constant monitoring of system efficiency is required.

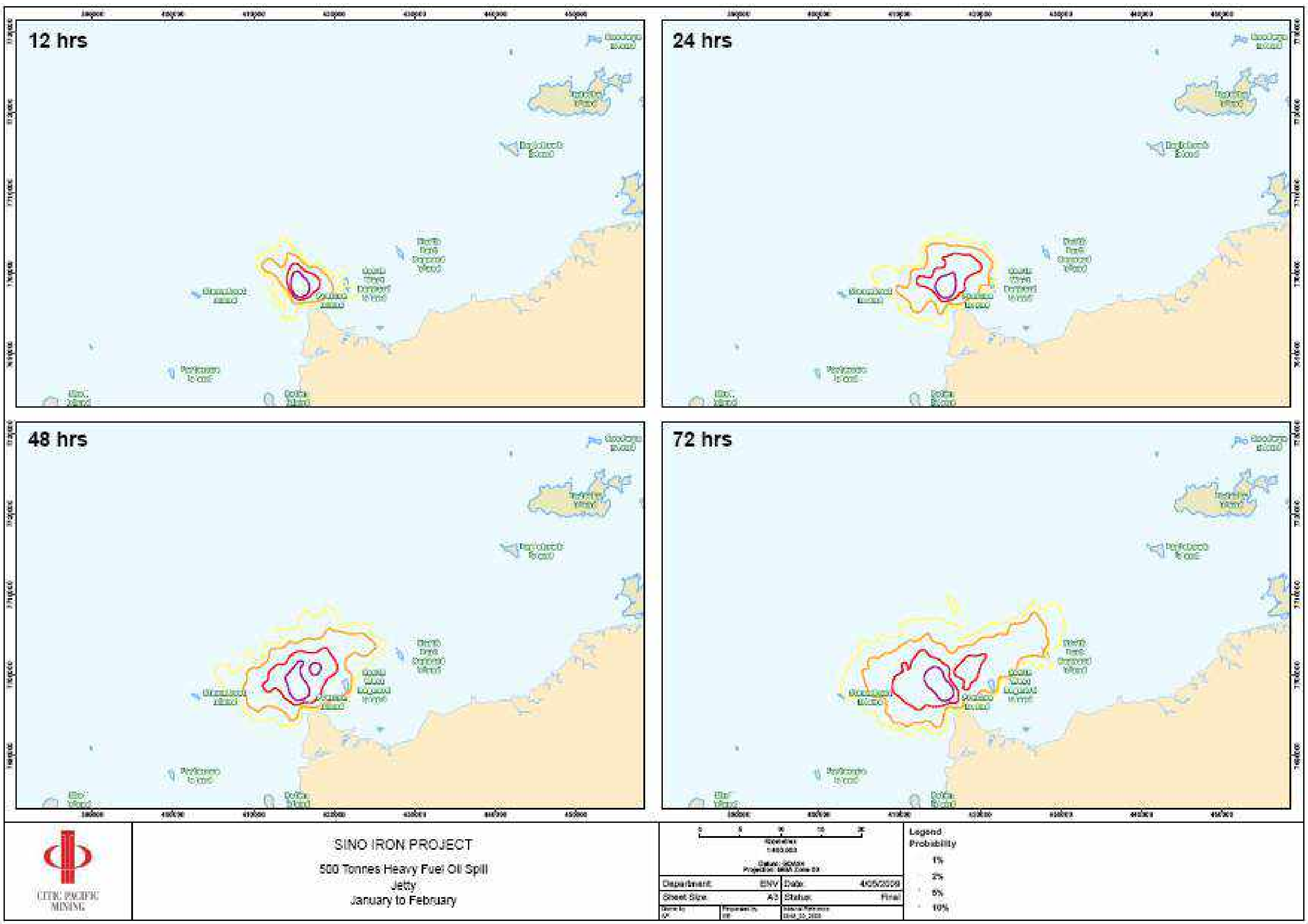
DO NOT Use Dispersant

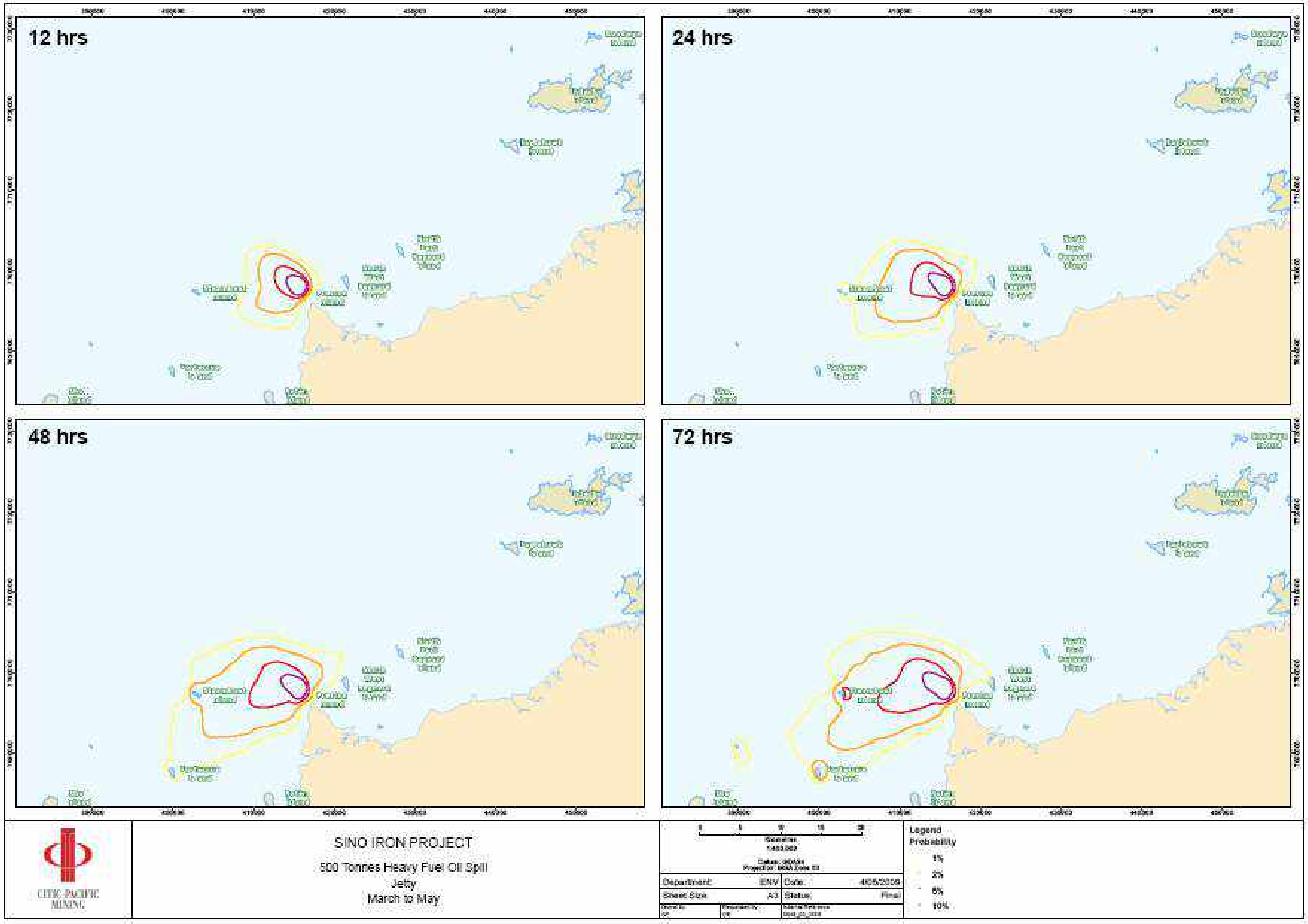
Shoreline Clean Up

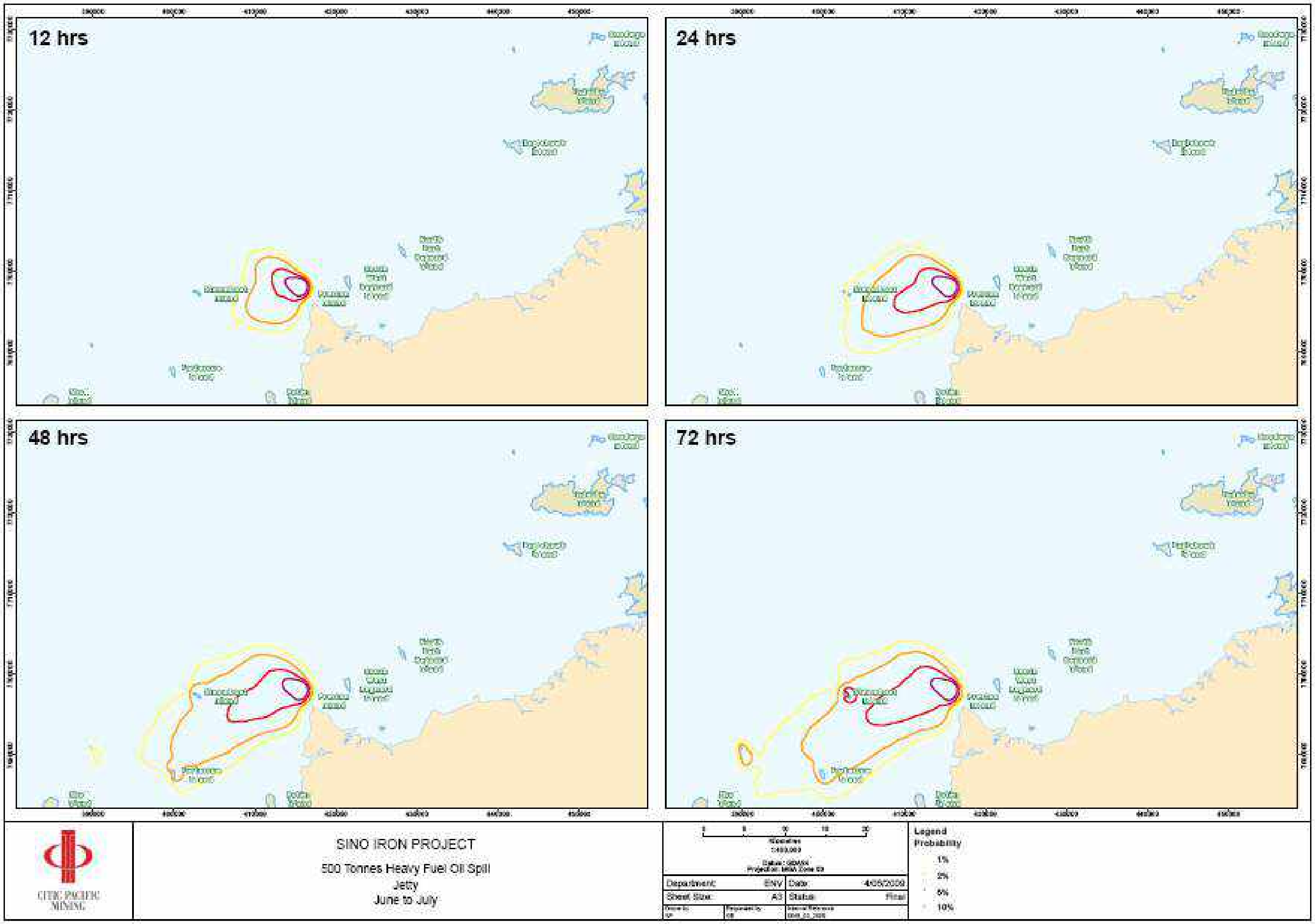
- Approximately 40% of the shoreline habitats in the area are made up of rocky shore:
  - Rocky shore is ranked as having *low sensitivity* based on the high-energy environment that usually present.
  - Highly viscous oil tends to attach itself firmly to hard surfaces, making clean-up difficult on rocky shores. However, when the oil has emulsified with water it may not adhere so readily.
  - Use suction device to remove pooled oil in gullies, rockpools and between boulders. Consider the environmental advantages of the method against the damage caused by trampling.
  - Use low pressure flushing with ambient temperature seawater. Oil needs to be held within a containment boom and picked up with skimmers before it can oil other shores.
  - Use sorbent to remove liquid oils in small areas like rockpools.
  - Use manual recovery such as forks and shovels to clean up oiled seaweed and tarballs
- Port facilities:
  - Port structures are considered as having *low sensitivity* and clean-up operation shall aim to return the port as quickly as possible to normal operations and to minimise the risk of mobilisation of oil into environmentally sensitive location.
  - Force out oil trapped under port structure by using ships propellers or fire house. Oil needs to be held within a containment boom and picked up with skimmers before it can oil other shores.
  - Remove oil stranded on shorelines and facilities by manually scrapping or wiping with rags or hot and cold water pressure cleaners.
  - Consider ventilation, headroom and accessibility for clean-up personnel in the semi-enclosed structure under the port structures.
- Sandy beaches:
  - Penetration into sandy beaches is likely to be minimal, thus removal of HFO from beaches with hard-packed sand is normally straightforward. Care must be taken if mechanical diggers are used so as not to mix oil with sand.
  - Fine-grained sand beaches are classified as having *mid level sensitivity* as they are relatively easy to clean, because the beach is usually able to support heavy equipment such

as road graders and penetration into the beach is limited to about 15 cm or less. Fine-grained sand beaches may be used as ‘sacrificial beach’.

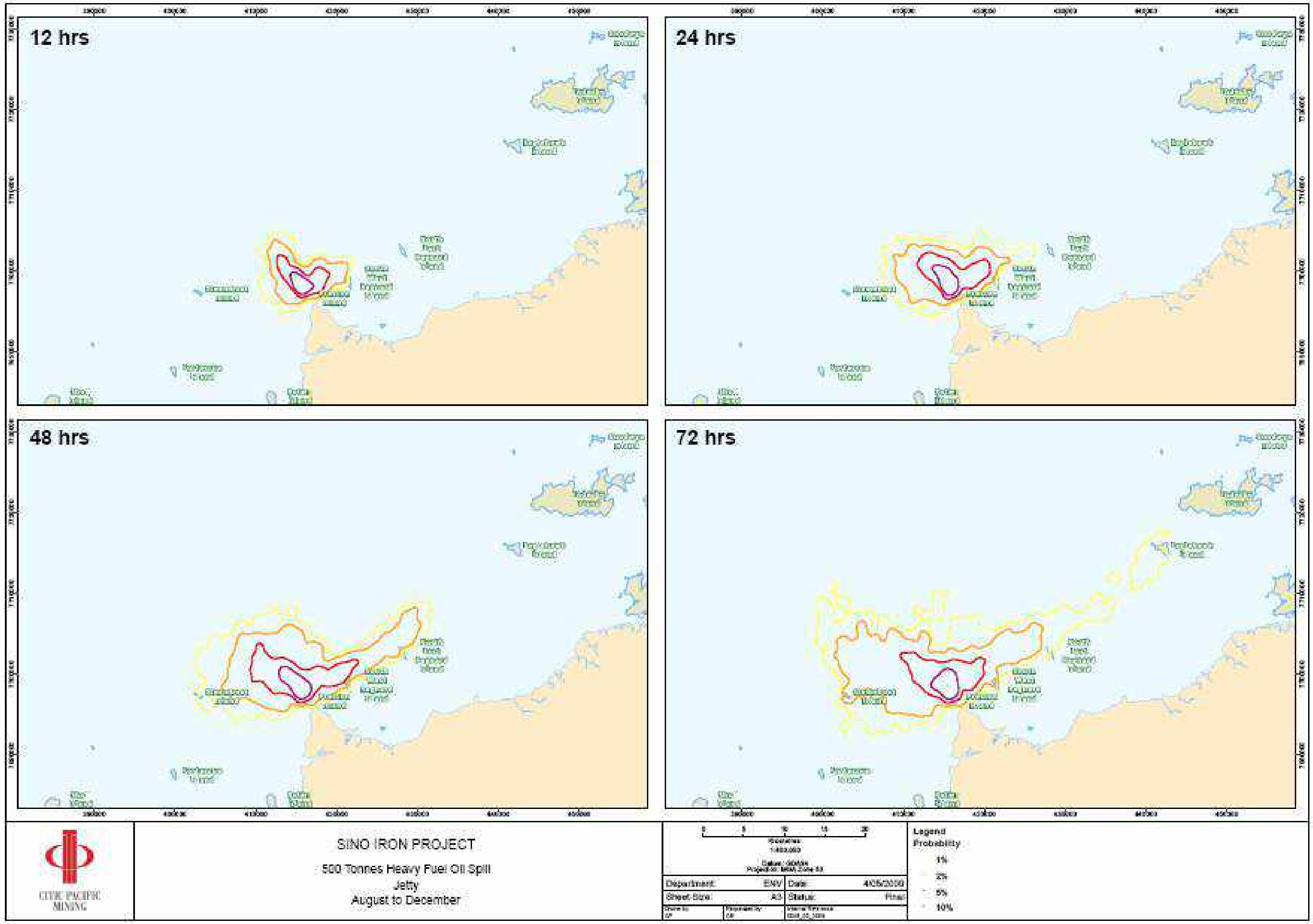
  - Sensitivity increases as grain size increases to gravel and cobble-sized material, because oil can penetrate very deeply into the beach, making cleanup extremely difficult.
  - Clean up of oil on coarse sands and gravels usually needs very intrusive physical processes, such as high-volume flushing. Oil flushed out then must be collected, for example with sorbents.
- Beaches at Cape Preston are relatively narrow with shallow intertidal mud flats:
  - Exposed tidal flats are ranked as having *moderately high sensitivity* because of the potential biological activity susceptible to oil spill damage.
  - Tidal flat are generally hard to access, therefore cleanup efforts maybe limited.


12 hrs
24 hrs
48 hrs
72 hrs
CITIC PACIFIC MINING
SINO IRON PROJECT
500 Tonnes Heavy Fuel Oil Spill
Jetty
January to February
Department: ENV
Sheet Size: A3
Status: Final
Legend
Probability
1%
2%
5%
10%


12 hrs
24 hrs
48 hrs
72 hrs
CITIC PACIFIC MINING
SINO IRON PROJECT
500 Tonnes Heavy Fuel Oil Spill
Jetty
March to May
Department: ENV
Date: 4/05/2009
Sheet Size: A3
Status: Final
Legend
Probability
1%
2%
5%
10%



12 hrs
24 hrs
48 hrs
72 hrs
CITIC PACIFIC MINING
SINO IRON PROJECT
500 Tonnes Heavy Fuel Oil Spill
Jetty
June to July
Department
ENV
Date
4/05/2009
Sheet Size
A3
Status
Final
Legend
Probability
1%
2%
5%
10%



12 hrs
24 hrs
48 hrs
72 hrs
CITIC PACIFIC MINING
SINO IRON PROJECT
500 Tonnes Heavy Fuel Oil Spill
Jetty
August to December
Legend
Probability
1%
2%
5%
10%
Department: ENV
Date: 4/05/2009
Sheet Size: A3
Status: Final

C.8 10 Tonnes HFO spill at the Transhipper

This is likely to be a spill that requires resources beyond the Port Operator's capability and therefore a Tier 2/3 spill response will be required.

The key initial response actions by the Port Operator shall be:

- Stop and contain the spill
- Report and communicate with the relevant agencies and escalate as required
- Mobilise Port and ECC resources and equipment as soon as possible to prevent escalation of the spill

Modelling results indicate that:

- The spill is likely to move offshore without impacting any shoreline or other environmental sensitive area immediately around Cape Preston
- The spill may move as far as 20km within 24 hours.

Behaviour:

- HFO are high density and when spilled on water spread into thick, dark coloured slicks
- Under certain conditions, it is possible for HFO slicks to submerge beneath the sea surface
- In high sediment areas (rivers, beaches) HFO could potentially sink once it picks up sediment, resulting in subsurface tarballs or tarmats
- HFO tend to be less toxic than crude oils and some other refined products, however strong adhesive properties and persistence may cause greater impact on fauna
- Because of its high viscosity, beached HFO tends to remain on the surface rather than penetrate sediments. Light accumulations usually form a "bathtub ring" at the high-tide line; heavy accumulations can pool on the beach.

Recommended Response Strategy (initial response with Port Operator resources and equipment)

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Monitor and evaluate spill constantly. Assumed worst case until better data is available:
  - It may be hard to assess spilled HFO from the air because the oil is not floating on the surface (see 'Behaviou').
  - When oil is visible on surface, it may not be possible to assess thickness of oil patches and therefore quantity of oil spilled.
- If required, request shall be made immediately to run a computer model to predict spread, weathering and movement of the oil spill.
- Given the location of the spill and the persistency of HFO, letting natural processes (evaporation and dispersion, etc) maybe considered as an option.

DO NOT Attempt Physical Break up:

- HFO tend to emulsify if mixing energy is applied;

Containment and Recovery:

- Secure the spillage and deploy booms and skimmers to contain the spillage and to minimise the risk of mobilisation of oils into environmentally or aesthetically sensitive environment:
  - Containment boom can also be used to encircle or otherwise entrap floating oil so it can be accumulated and recovered at the spill location - a grounded barge, a vessel at anchor or at dockside.
  - See ‘containment and recovery’ decision guide (Figure 3-1) before deploying booms;
  - For a spill in calm weather along with minimal current movement (<0.75 knots), oil can be contained by stretching a boom across a waterway perpendicular to the path of the spill.
  - Entrainment or loss of oil under the boom begins to occur when a boom is placed perpendicular to a current > 0.75 knots. Adjust the boom an angle depending on the current strength.
- Recover oil:
  - Because HFO does not spread as liquid oil would, skimmers have an inherent difficulty maintaining sufficient feed.
  - Rope Mop skimmer may be used to recover HFO.
- The success of a recovery operation depends on adequate offshore and onshore facilities for storing the recovered oil and oily water. The logistics of storage and transfer of recovered oil needs to be planned by the ECC team;
  - Pumping into and out of on-board temporary storage will be much more difficult than with lighter oils.
  - Storage tanks may require heating to make transfer operations much more efficient.
- Manual methods of recovery are slower than using equipment but may be equally effective:
  - Given its viscosity, low-tech recovery methods, e.g. crane-operated clamshells, or other mechanical grabs, are likely to be more efficient than sophisticated skim-and-pump techniques.
  - Sorbent materials, buckets, rakes, shovels, plastic sacks and appropriate protective clothing can also be used;
  - Do not overfill containers, as they will have to be carried safely out of the spill area;
  - Lay sorbents pads or sheets on walkways to prevent pollution being trodden into uncontaminated areas;
  - Look after the needs of clean-up personnel, as the work is labour intensive, dirty, tiring, boring and possibly dangerous;

Shoreline Protection

- Use sorbent booms (or sorbent snares) to protect the shore/breakwater area if required;
- Use booms to intercept, deflect, or move a slick towards a more desirable recovery site if necessary:

– Readjust angles and widths between boom sections as necessary to meet changing conditions (tides, currents, and winds);

– Constant monitoring of system efficiency is required.

Dispersant Use

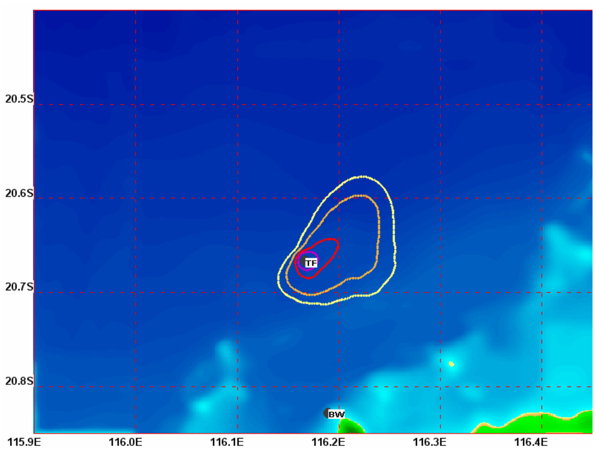
- See ‘dispersant’ decision guide (Figure 3-2) before using dispersant;
- HFO do not disperse naturally in a significant manner and oil spill dispersants may prove ineffective.

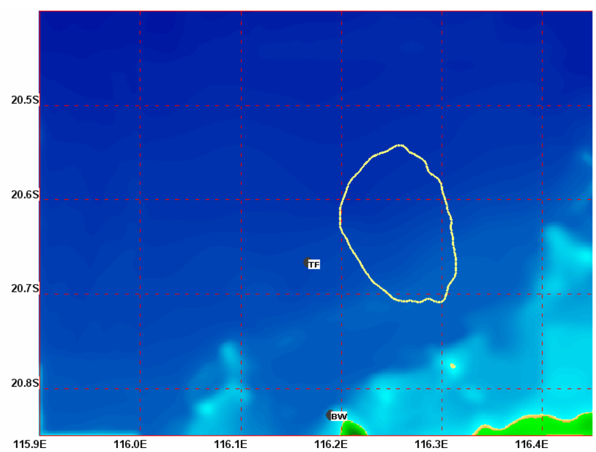
Shoreline Clean Up

- Based on the modelling result, shoreline oiling is unlikely. Consult Section 3.4.6 if shorelines clean up is required.

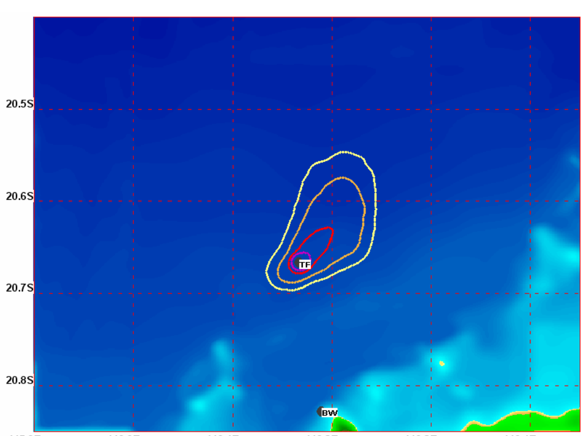
Trajectory Plot for a 10 tonne Marine Heavy Fuel Oil Spill at the Transhipper

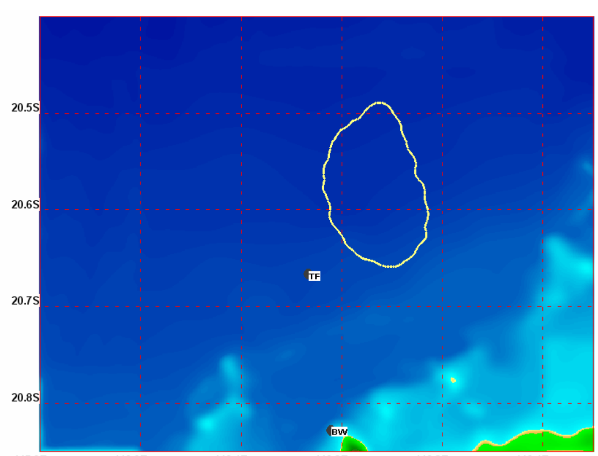
- January to February, after 12 and 24 hours



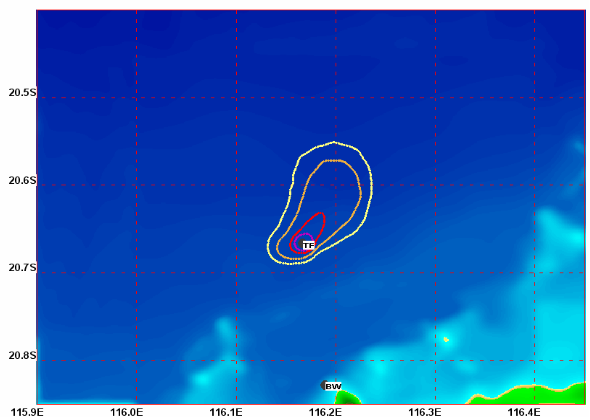


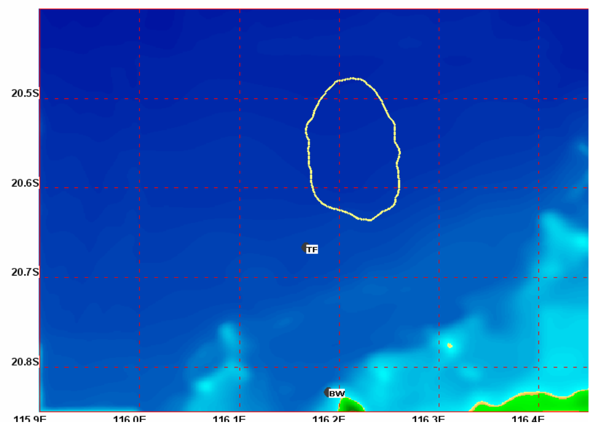
- March to May after 3. 12 and 24 hours



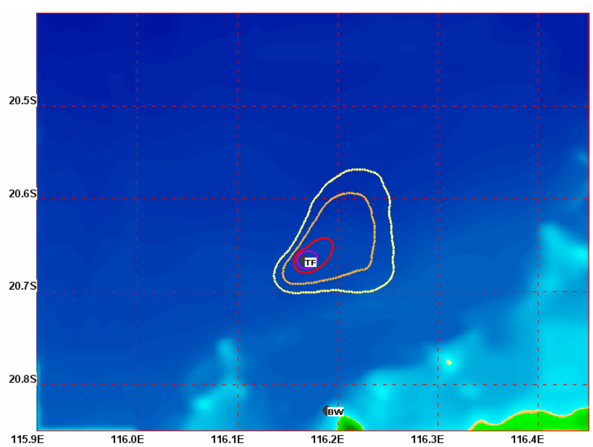


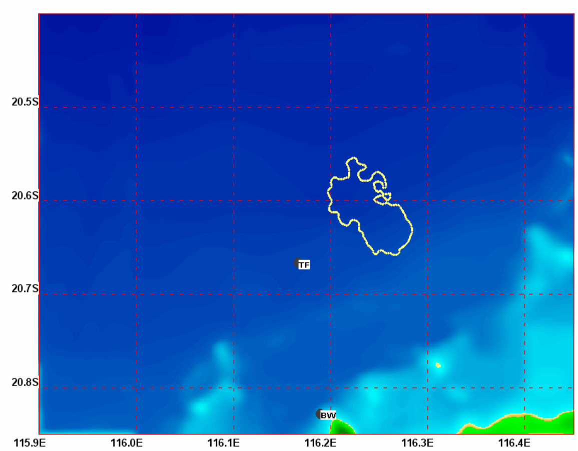
- June to July after 3, 12 and 24 hours





- August to December after 12 and 24 hours





Contour	1	2	5	10	25	50

C.9 100 Tonnes HFO Spill at the Transhipper

This is likely to be a spill that requires resources beyond the Port Operator's capability and therefore a Tier 2/3 spill response will be required.

The key initial response actions by the Port Operator shall be:

- Stop and contain the spill
- Report and communicate with the relevant agencies and escalate as required
- Mobilise Port and ECC resources and equipment as soon as possible to prevent escalation of the spill

Modelling results indicate that:

- The spill is likely to move offshore and may travel more than 20km from the initial spill location within 48 hours
- There is a change that the spill will impact on Eaglehawk and Enderby Islands 72 hours after the initial spill during January-February and/or August-December periods.

Behaviour:

- HFO are high density and when spilled on water spread into thick, dark coloured slicks
- Under certain conditions, it is possible for HFO slicks to submerge beneath the sea surface
- In high sediment areas (rivers, beaches) HFO could potentially sink once it picks up sediment, resulting in subsurface tarballs or tarmats
- HFO tend to be less toxic than crude oils and some other refined products, however strong adhesive properties and persistence may cause greater impact on fauna
- Because of its high viscosity, beached HFO tends to remain on the surface rather than penetrate sediments. Light accumulations usually form a "bathtub ring" at the high-tide line; heavy accumulations can pool on the beach.

Recommended Response Strategy (initial response with Port Operator resources and equipment)

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Monitor and evaluate spill constantly. Assumed worst case until better data is available:
  - It may be hard to assess spilled HFO from the air because the oil is not floating on the surface (see 'Fate').
  - When oil is visible on surface, it may not be possible to assess thickness of oil patches and therefore quantity of oil spilled.
- If required, request shall be made immediately to run a computer model to predict spread, weathering and movement of the oil spill.

- Given the location of the spill and the persistency of HFO, letting natural processes (evaporation and dispersion, etc) to take place is NOT an option.

DO NOT Attempt Physical Break up:

- HFO tend to emulsify if mixing energy is applied;

Containment and Recovery:

- Secure the spillage and deploy booms and skimmers to contain the spillage and to minimise the risk of mobilisation of oils into environmentally or aesthetically sensitive environment:
  - See 'containment and recovery' decision guide (Figure 3-1) before deploying booms;
  - For a spill in calm weather along with minimal current movement (<0.75 knots), oil can be contained by stretching a boom across a waterway perpendicular to the path of the spill.
  - Entrainment or loss of oil under the boom begins to occur when a boom is placed perpendicular to a current > 0.75 knots. Adjust the boom an angle depending on the current strength.
  - Containment boom can also be used to encircle or otherwise entrap floating oil so it can be accumulated and recovered at the spill location - a grounded barge, a vessel at anchor or at dockside.
- Recover oil:
  - Because HFO does not spread as liquid oil would, skimmers have an inherent difficulty maintaining sufficient feed.
  - Rope Mop skimmer may be used to recover HFO.
- The success of a recovery operation depends on adequate offshore and onshore facilities for storing the recovered oil and oily water. The logistics of storage and transfer of recovered oil needs to be planned by the ECC team;
  - Pumping into and out of on-board temporary storage will be much more difficult than with lighter oils.
  - Storage tanks may require heating to make transfer operations much more efficient.
- Manual methods of recovery are slower than using equipment but may be equally effective:
  - Given its viscosity, low-tech recovery methods, e.g. crane-operated clamshells, or other mechanical grabs, are likely to be more efficient than sophisticated skim-and-pump techniques.
  - Sorbent materials, buckets, rakes, shovels, plastic sacks and appropriate protective clothing can also be used;
  - Do not overfill containers, as they will have to be carried safely out of the spill area;
  - Lay sorbents pads or sheets on walkways to prevent pollution being trodden into uncontaminated areas;
  - Look after the needs of clean-up personnel, as the work is labour intensive, dirty, tiring, boring and possibly dangerous;

Shoreline Protection

- Use sorbent booms (or sorbent snares) to protect the shore/breakwater area if required;

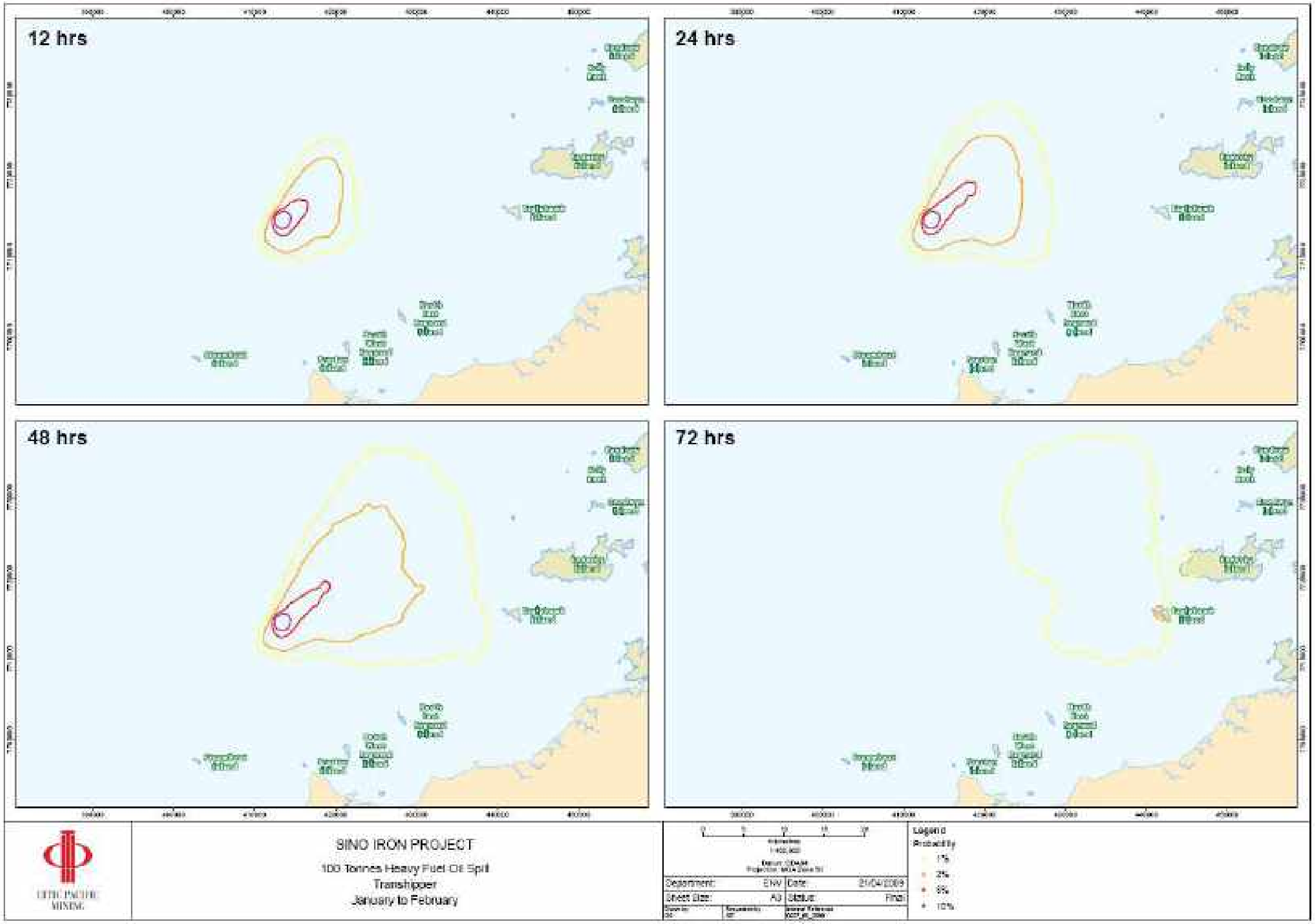
- Use booms to intercept, deflect, or move a slick towards a more desirable recovery site if necessary:
  - Readjust angles and widths between boom sections as necessary to meet changing conditions (tides, currents, and winds);
  - Constant monitoring of system efficiency is required.

Dispersant Use

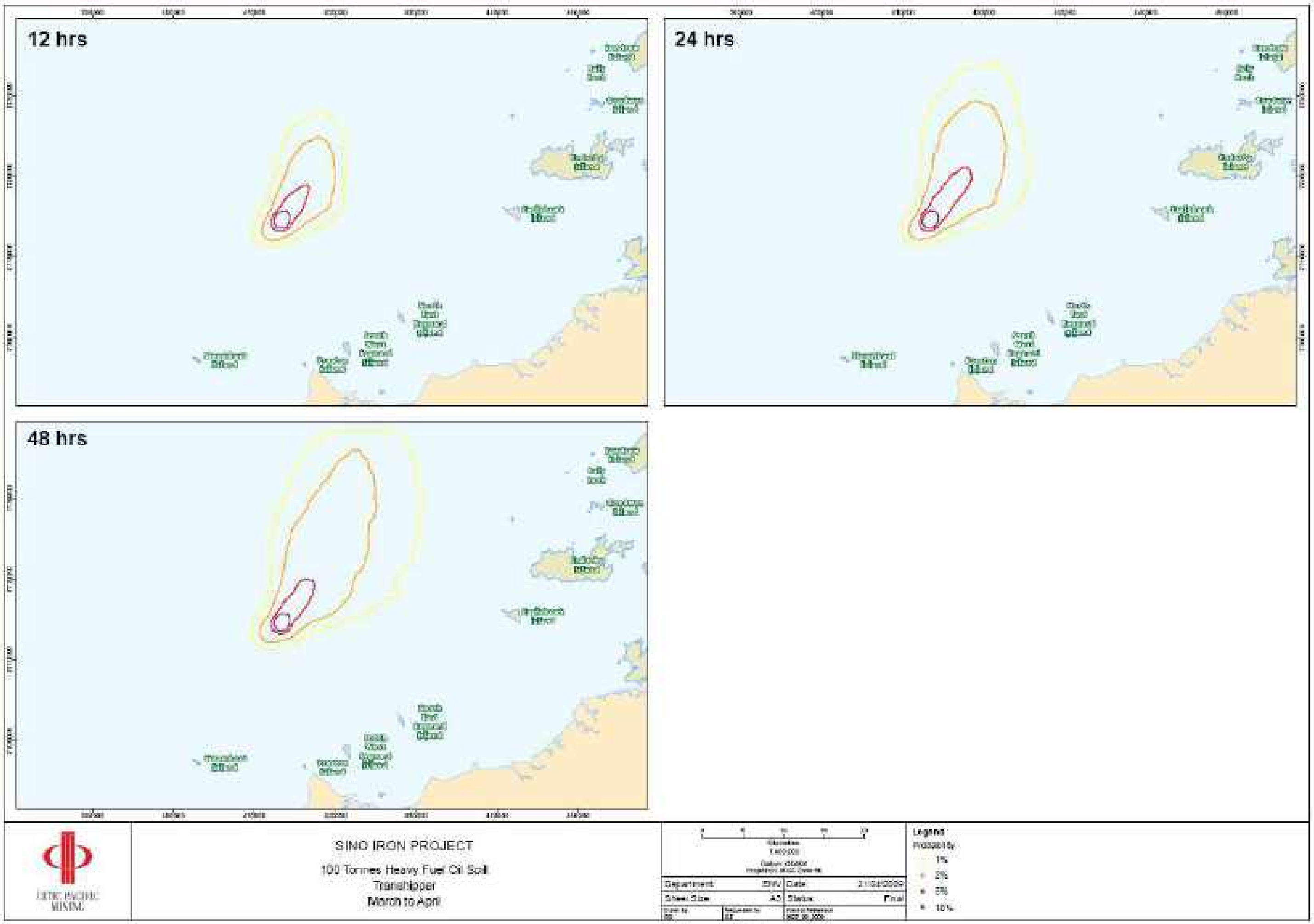
- See 'dispersant' decision guide (Figure 3-2) before using dispersant;
- HFO do not disperse naturally in a significant manner and oil spill dispersants may prove ineffective.

Shoreline Clean Up

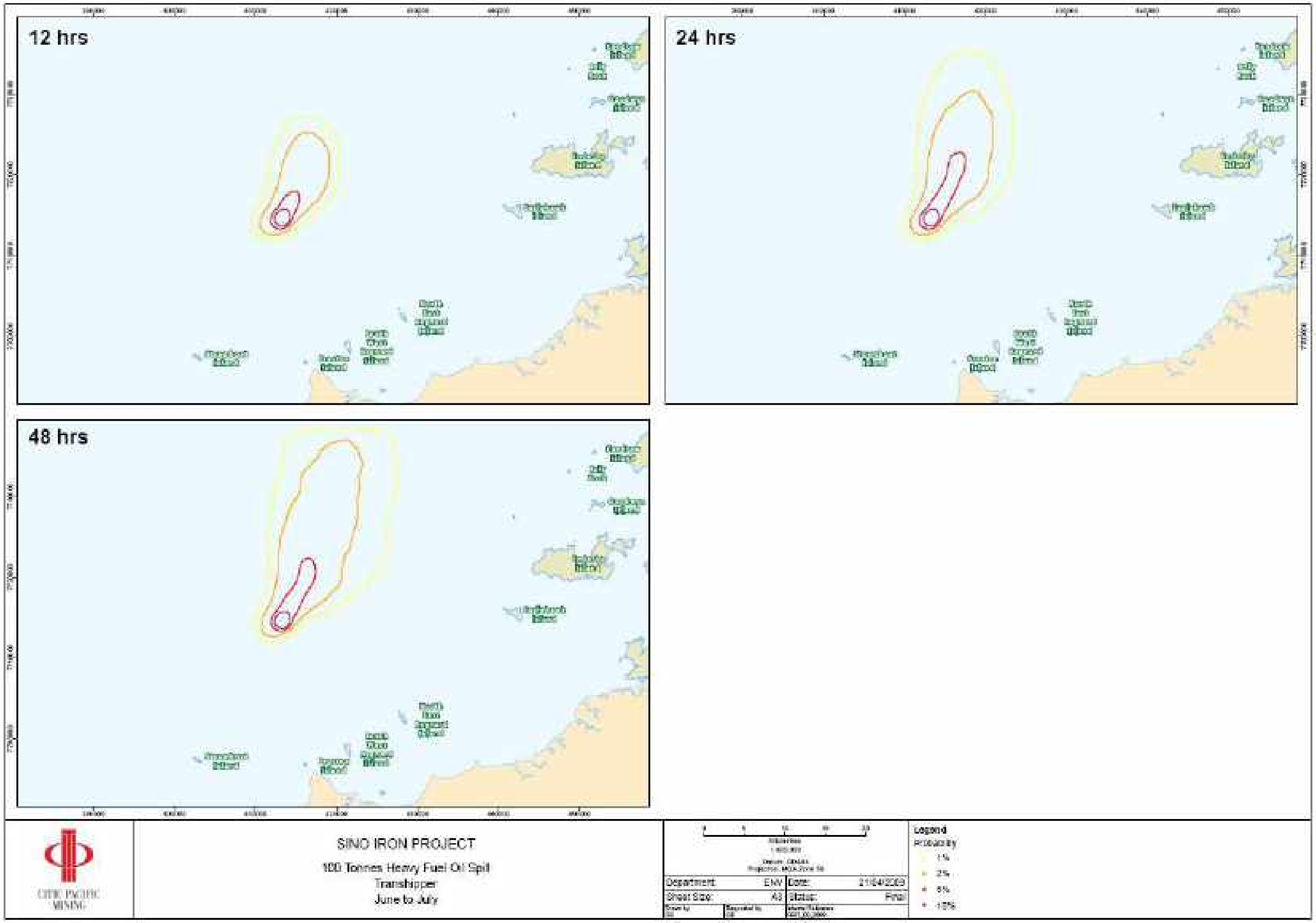
- Based on the modelling result, shoreline oiling of the Eaglehawk and Enderby Islands is likely to occur 72 hours after the initial spill during January-February and/or August-December periods if there is no intervention.
- As there is enough time (~72 hours) to mount response operations, the strategy shall focus on shoreline protection (through booming, etc).
- Consult Section 3.4.6 if shorelines clean up is required.

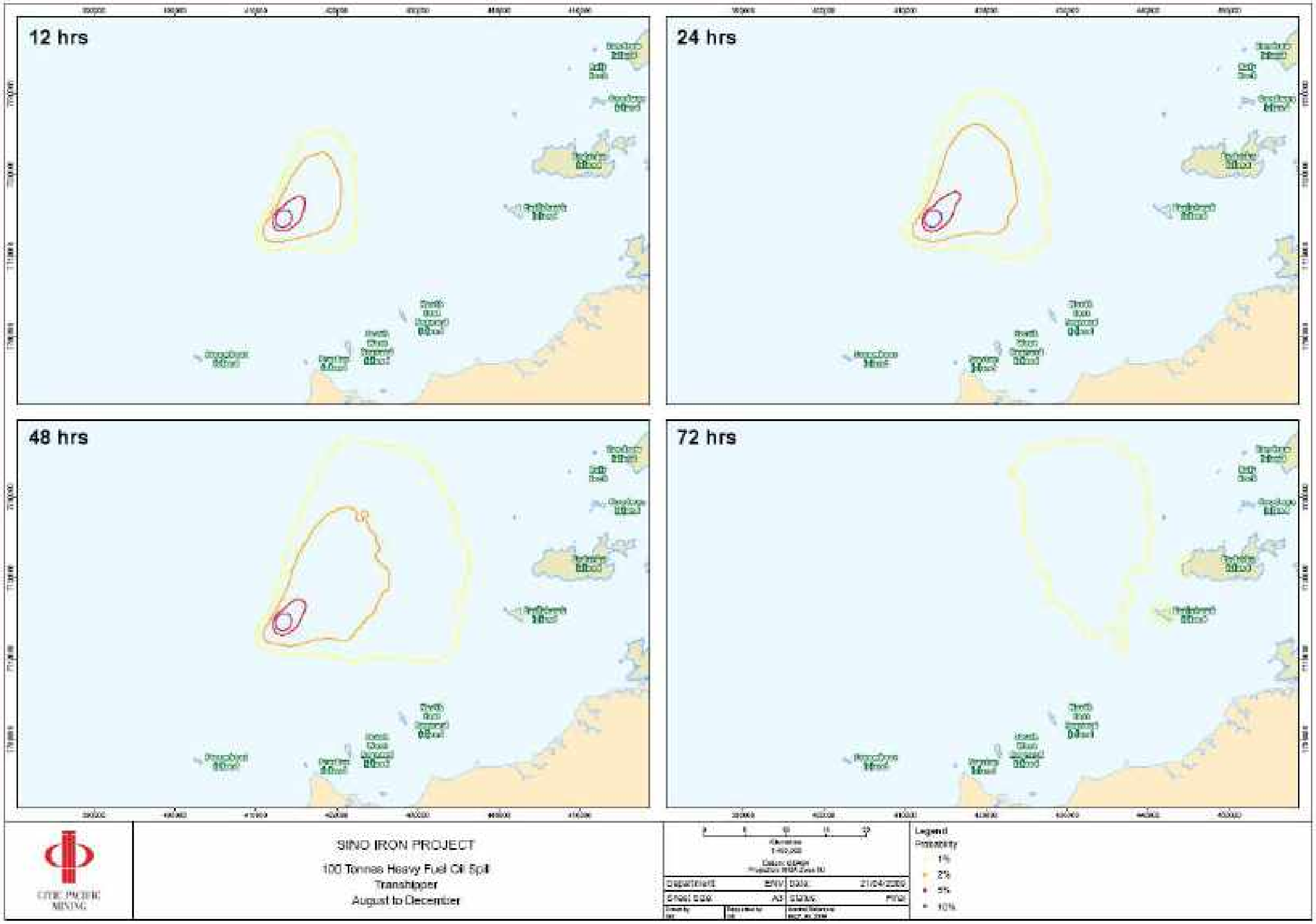


12 hrs
24 hrs
48 hrs
72 hrs
SINO IRON PROJECT
100 Tonnes Heavy Fuel Oil Spill
Transhipper
January to February
Department: ENV
Date: 21/04/2009
Sheet Size: A3
Status: Final
Legend
Probability
1%
2%
5%
10%



12 hrs
24 hrs
48 hrs
SINO IRON PROJECT
100 Tonnes Heavy Fuel Oil Spill
Transhipper
March to April
Legend
1%
2%
5%
10%
Department
ENV
Date
21/04/2009
Sheet Size
A3
Status
Final


12 hrs
24 hrs
48 hrs
CITIC PACIFIC MINING
SINO IRON PROJECT
100 Tonnes Heavy Fuel Oil Spill
Transhipper
June to July
Department: ENV
Date: 21/04/2009
Sheet Size: A3
Status: Final
Legend
Probability
1%
2%
5%
10%



12 hrs
24 hrs
48 hrs
72 hrs
SINO IRON PROJECT
100 Tonnes Heavy Fuel Oil Spill
Transhipper
August to December
Legend
Probability
1%
2%
5%
10%

C.10 5000 Litres Diesel spill at the Transhipper

Modelling results indicate that:

- The spill will spread radially within a few hundred metres from the spill source.
- The spill is likely to stay offshore without impacting any shorelines or other environmental sensitivities

Behaviour:

- Diesel slicks will spread rapidly and forms rainbow and silver sheen within a few hours.
- Evaporation is generally rapid, especially if there is a high wind. Normally it will be difficult to see any remaining diesel in the water 24 hours after the spill.
- The environmental impacts resulting from a 5000 litres diesel spill are likely to be very localised.

Recommended Response Strategy (initial response with Port Operator resources and equipment)

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Generally, a spill of diesel is not dangerous and disperses within 24 hours. Given the relatively small size of the spill and its offshore remote location with little possibility of reaching the shoreline, the best response option is to monitor and to let it evaporate;

Physical Break up:

- Water cannon or propeller waves can be used to help diesel dispersion;

Containment and Recovery:

- Secure the spillage and deploy booms and skimmers to contain the spillage and to minimise the risk of mobilisation of oils into environmentally or aesthetically sensitive environment:
  - See ‘containment and recovery’ decision guide (Figure 3-1) before deploying booms;
  - Containment boom can also be used to encircle or otherwise entrap floating oil so it can be accumulated and recovered at the spill location - a grounded barge, a vessel at anchor or at dockside.
  - Entrainment or loss of oil under the boom begins to occur when a boom is placed perpendicular to a current > 0.75 knots. Adjust the boom an angle depending on the current strength.
- Use skimmers to recover oils:
  - If the diesel, which is collected inside the boom, is in a thick enough layer on the water surface it may be recoverable using a skimmer.
  - If the diesel has spread to sheen then there is only a very thin layer on the surface, and virtually no diesel would be recovered by a skimmer.

- The success of a recovery operation depends on adequate offshore and onshore facilities for storing the recovered oil and oily water. The logistics of storage and transfer of recovered oil needs to be planned by the ECC team;

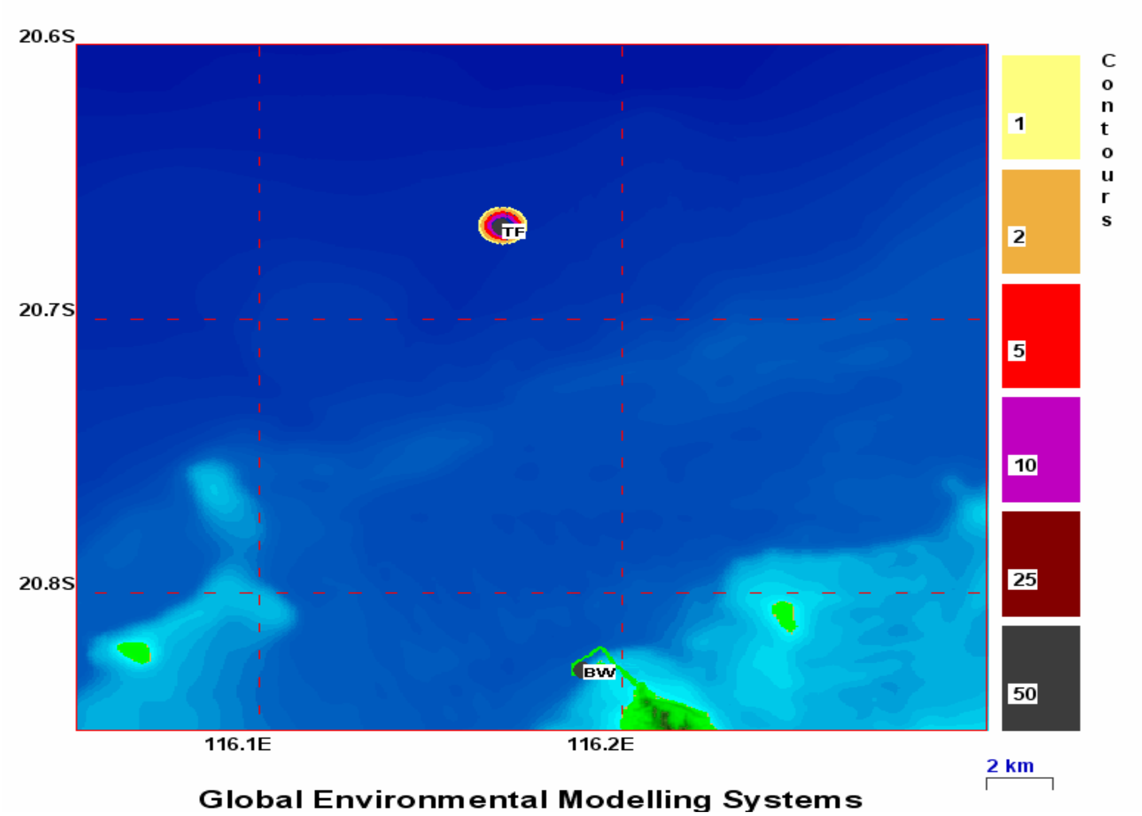
Do not use dispersant

Shoreline Cleanup

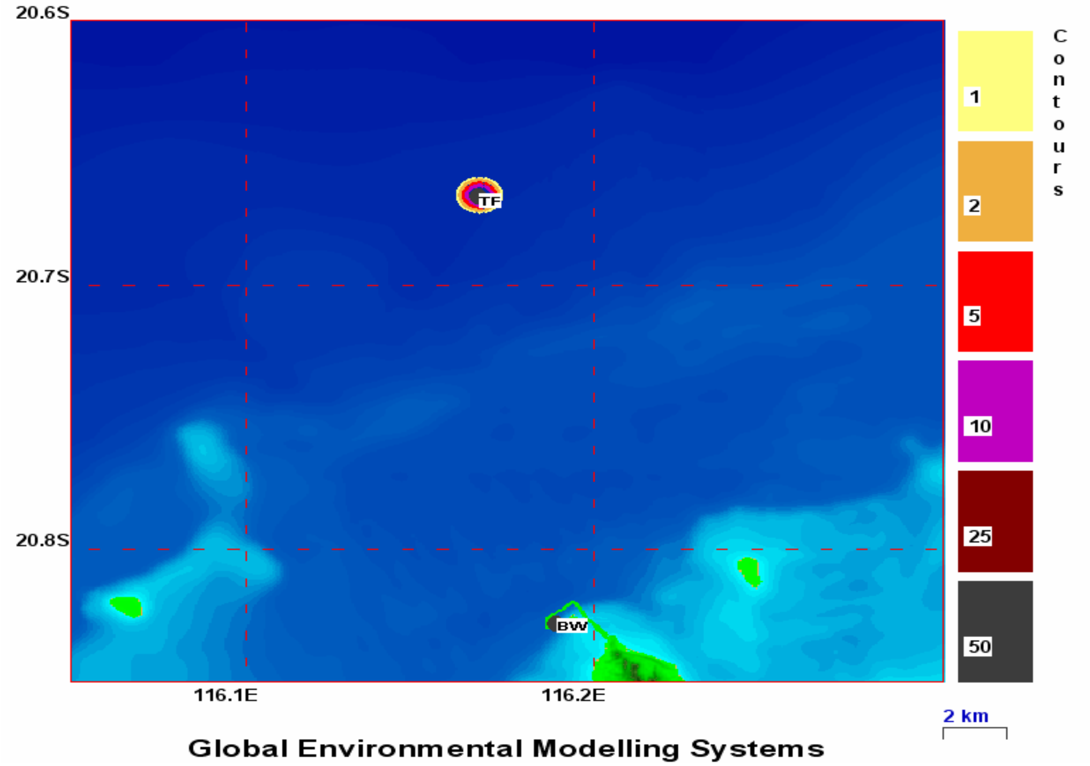
- Based on the modelling results, shoreline oiling is unlikely. If cleanup is required, consult Section 3.4.6

Trajectory Plot for a 5000 litre Marine Diesel Spill at Transhipper

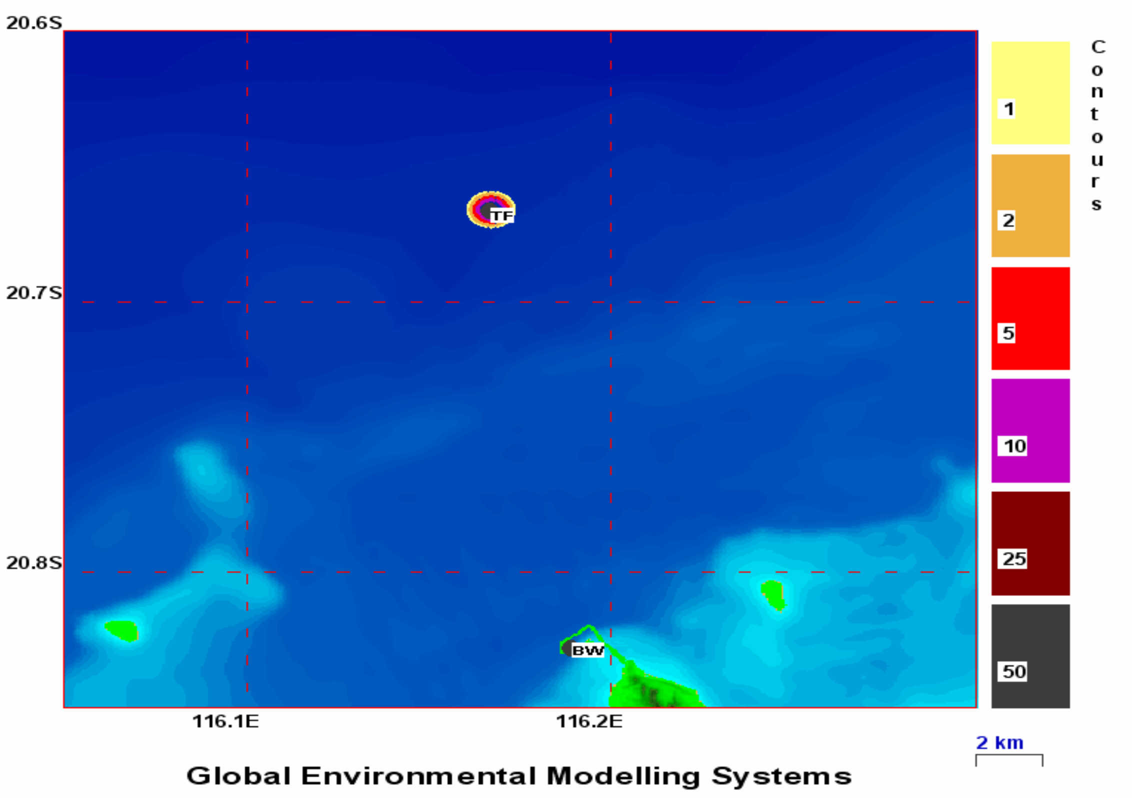
- January to February after 3 hours



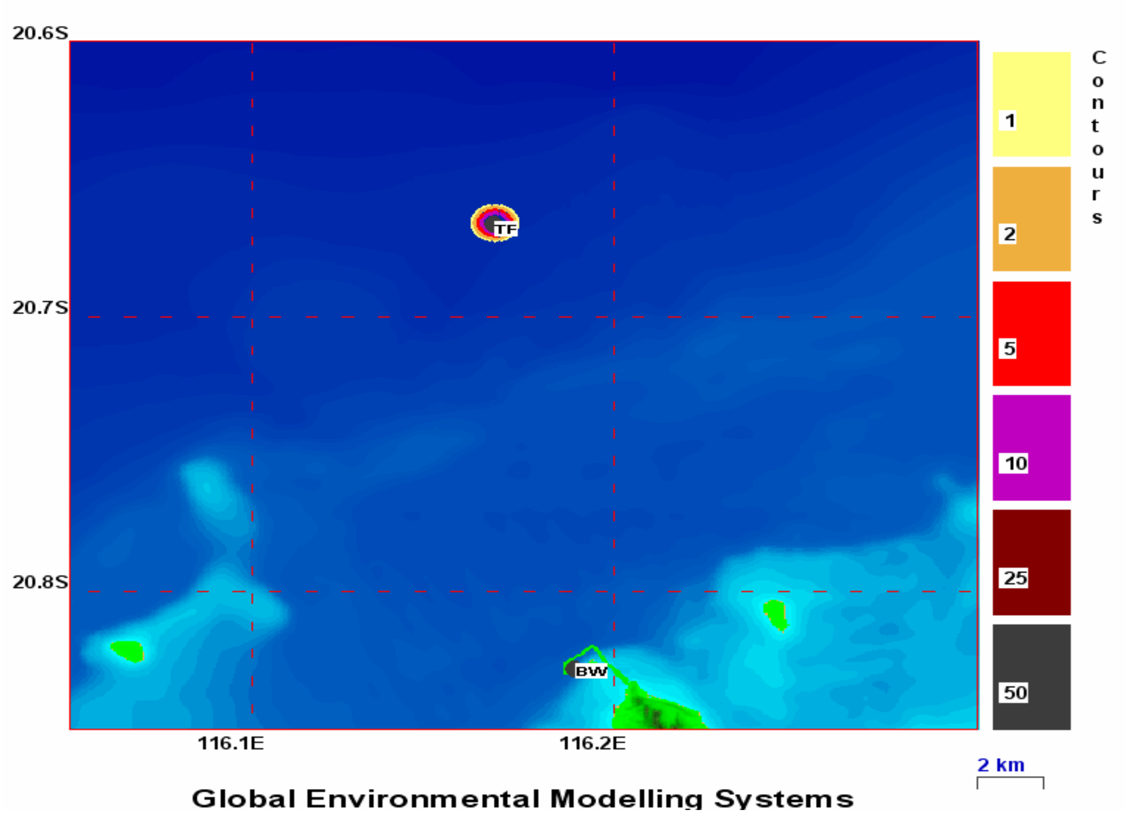
- March to May after 3 hours.



- June to July after 3 hours



- August to December after 3 hours


20.6S
20.7S
20.8S
116.1E
116.2E
TF
BW
Contours
1
2
5
10
25
50
2 km
Global Environmental Modelling Systems

C.11 100,000 Litres Diesel spill at the Transhipper

This is likely to be a spill that requires resources beyond the Port Operator's capability and therefore a Tier 2/3 spill response will be required.

The key initial response actions by the Port Operator shall be:

- Stop and contain the spill
- Report and communicate with the relevant agencies and escalate as required
- Mobilise Port and ECC resources and equipment as soon as possible to prevent escalation of the spill

Modelling results indicate that:

- The spill is likely to stay offshore and may travel more than 20km from the initial spill location within 48 hours
- The spill is unlikely to contact Cape Preston or any of the surrounding islands.

Behaviour:

- Diesel slicks will spread rapidly and forms rainbow and silver sheen within a few hours.
- Diesel is considered to be one of the most acutely toxic oil types. Fish, invertebrates and seaweed that come in direct contact with a diesel spill may be killed.
- Diesel spills can affect marine birds by direct contact. Mortality is caused by ingestion during preening as well as to hypothermia from matted feathers. However, diesel spills could result in serious impacts to birds under the "wrong" conditions, such as slick impacting a large nesting colony or transport of sheens into a high bird concentration area.

Recommended Response Strategy (initial response with Port Operator resources and equipment)

Initial Response:

- Carry out the initial actions described in Section 1;

Monitor and Evaluate:

- Generally, a spill of diesel will disperse within 24 hours. However, given the size of the spill and the likelihood of it impacting the islands around Cape Preston, letting natural processes to to take place may not be appropriate;

Physical Break up:

- Try to disperse it using the water cannon or propeller waves;

Containment and Recovery:

- Secure the spillage and deploy booms and skimmers to contain the spillage and to minimise the risk of mobilisation of oils into environmentally or aesthetically sensitive environment:
  - See 'containment and recovery' decision guide (Figure 3-1) before deploying booms;

- Containment boom can also be used to encircle or otherwise entrap floating oil so it can be accumulated and recovered at the spill location - a grounded barge, a vessel at anchor or at dockside.
- Entrainment or loss of oil under the boom begins to occur when a boom is placed perpendicular to a current > 0.75 knots. Adjust the boom an angle depending on the current strength.

- Use skimmers to recover oils:
  - If the diesel, which is collected inside the boom, is in a thick enough layer on the water surface it may be recoverable using a skimmer.
  - If the diesel has spread to a sheen then there is only a very thin layer on the surface, and virtually no diesel would be recovered by a skimmer.
- Manual methods of recovery are slower than using equipment but may be equally effective. Sorbent materials, buckets, rakes, shovels, plastic sacks and appropriate protective clothing are required;
  - Remove small pools of oil by using hand pumps and buckets;
  - Do not overfill containers, as they will have to be carried safely out of the spill area;
  - Lay sorbents pads or sheets on walkways to prevent pollution being trodden into uncontaminated areas;
  - Look after the needs of clean-up personnel, as the work is labor intensive, dirty, tiring, boring and possibly dangerous;
  - Sort out and segregate different types of contaminated waste.
- The success of a recovery operation depends on adequate offshore and onshore facilities for storing the recovered oil and oily water. The logistics of storage and transfer of recovered oil needs to be planned by the ECC team;

Sorbents:

- Use sorbent booms (or sorbent snares) to remove oil from water surface;

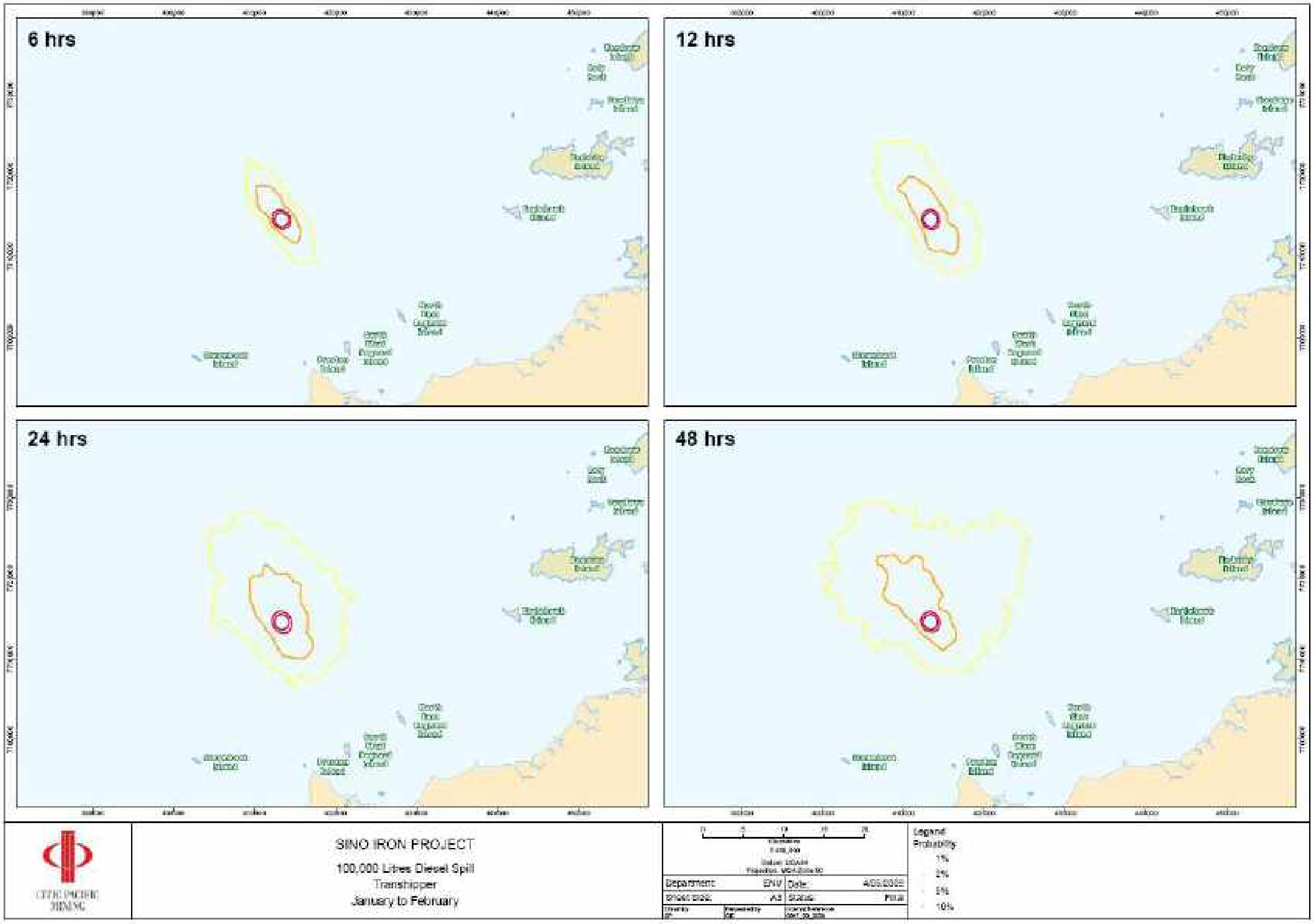
Shoreline Protection

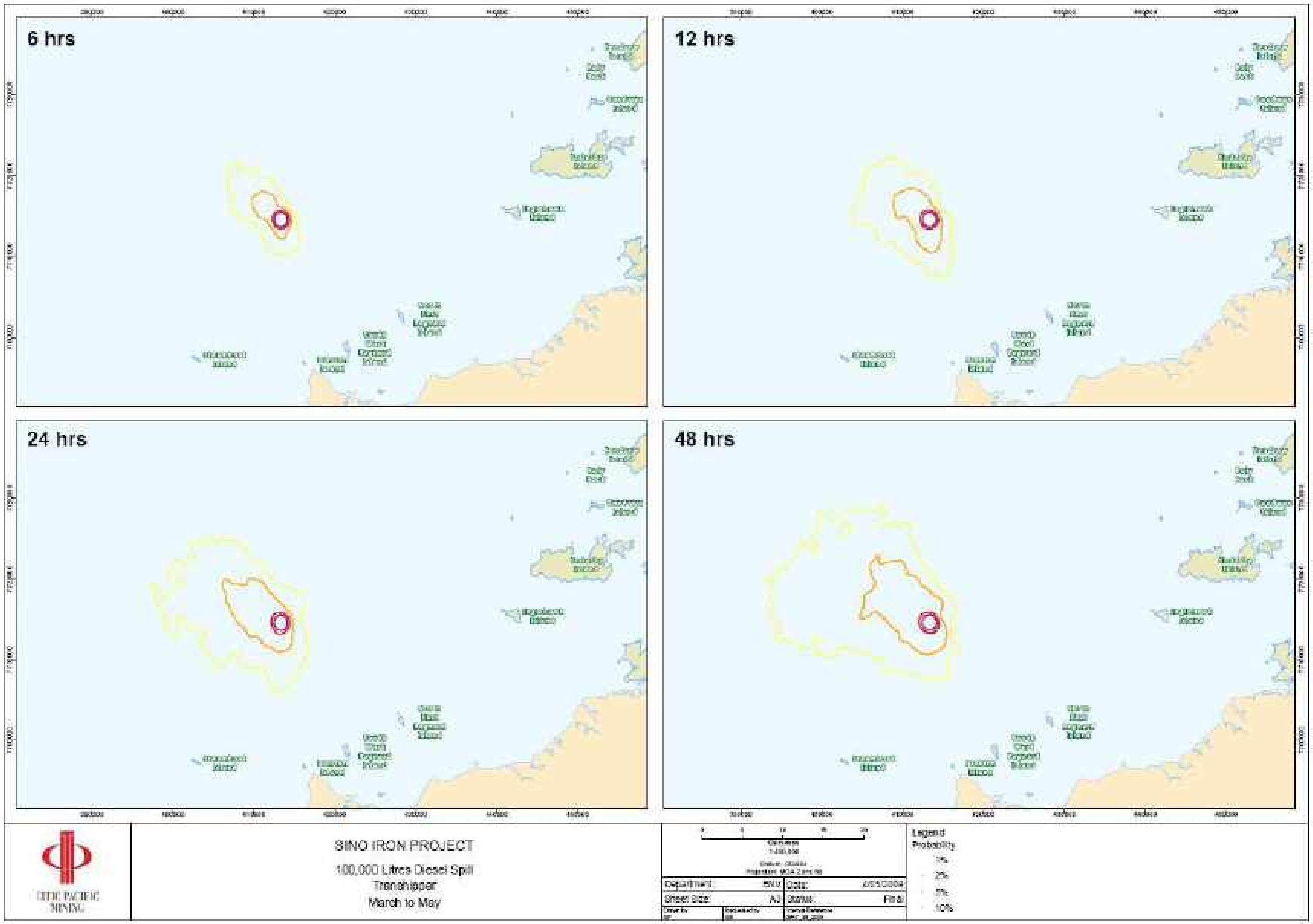
- Modelling has shown that contact with shoreline is unlikely.
- Consult Section 3.4.5 if shoreline protection is required.

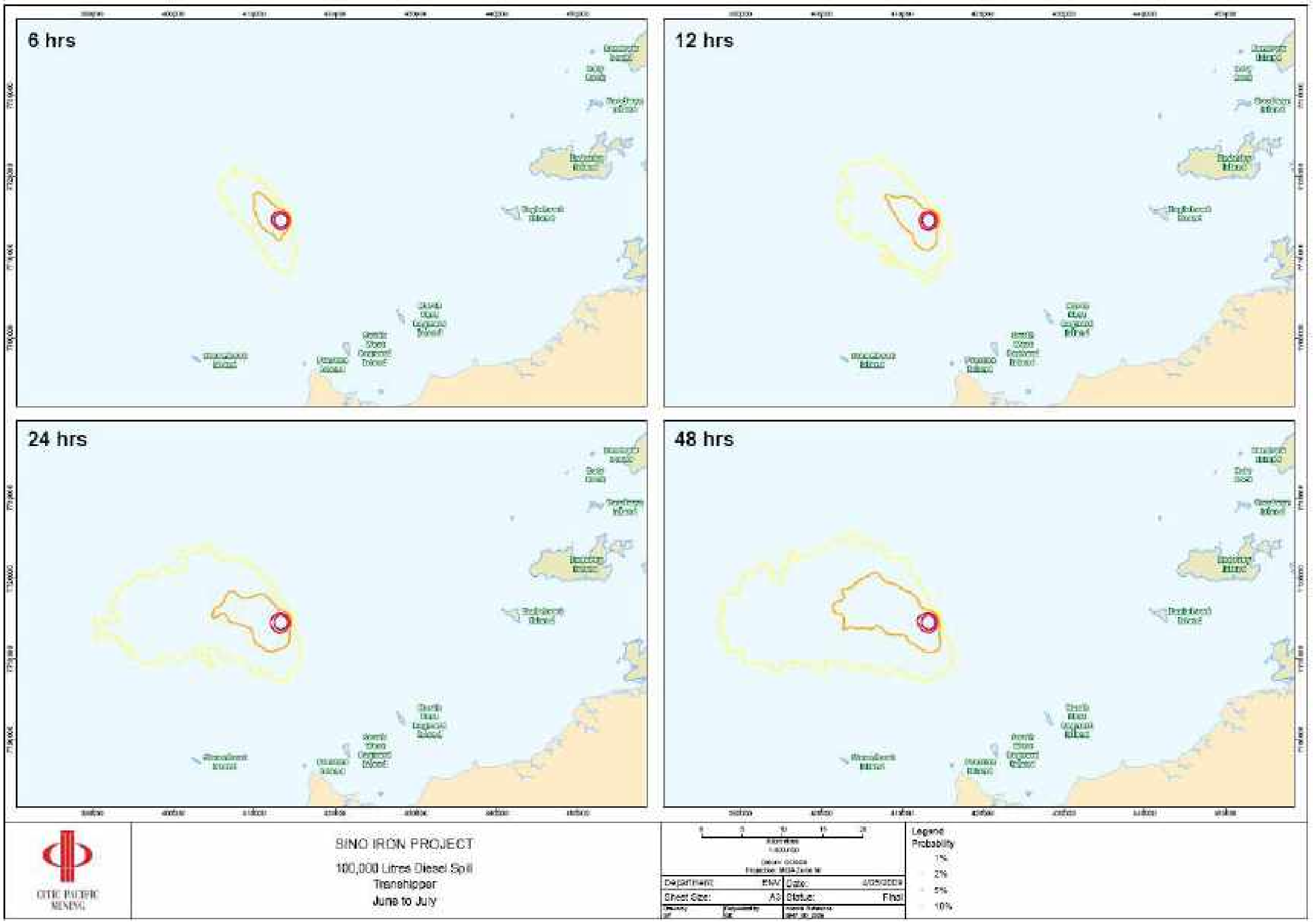
Shoreline Clean-up

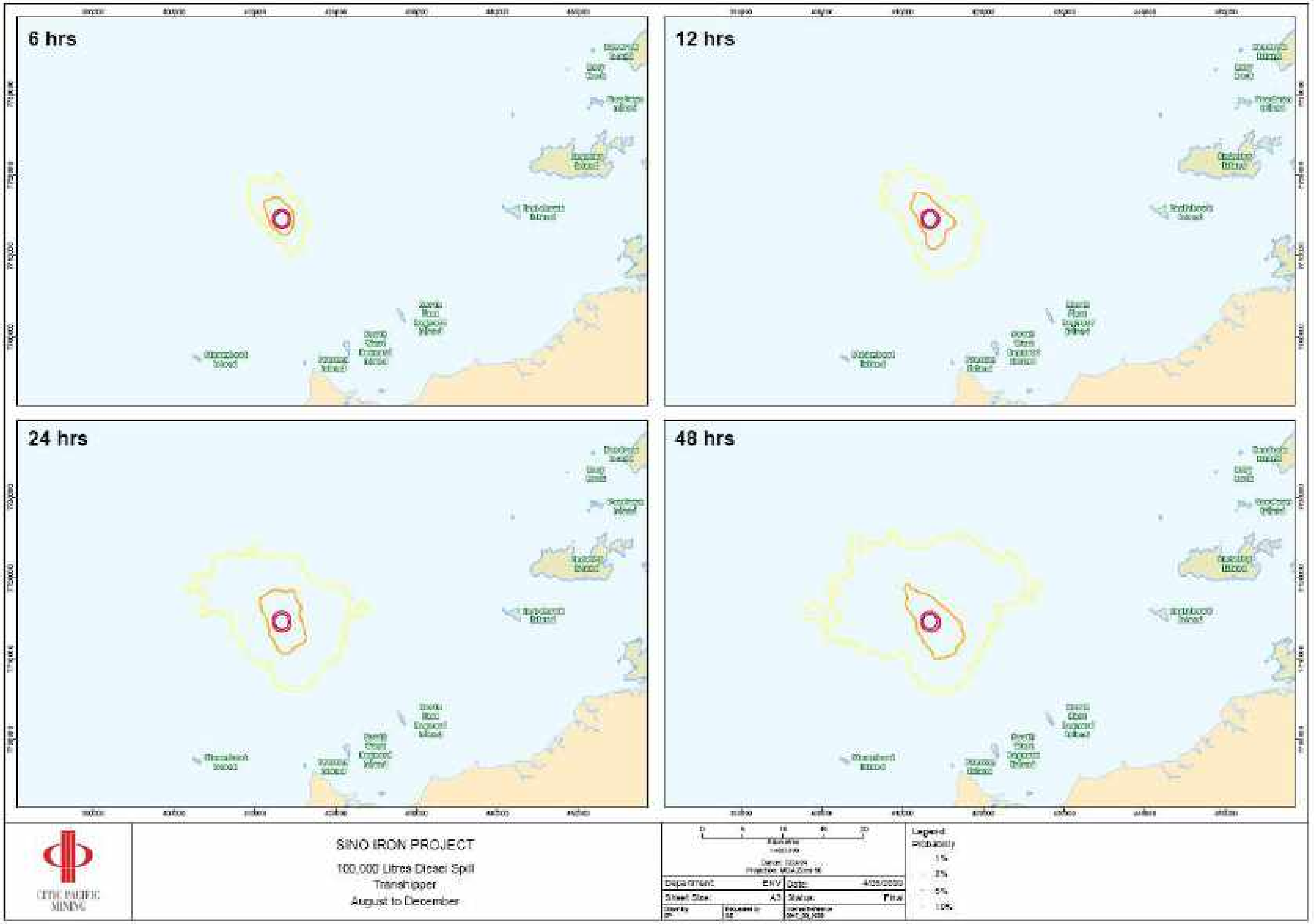
- Diesel oil is not very sticky or viscous, compared to black oils. Although the oil tends to penetrate porous sediments quickly, it also tends to be washed off quickly by waves and tidal flushing. Thus, shoreline cleanup is usually not needed. However, monitoring of oily shorelines will be required

Do not use dispersant


6 hrs
12 hrs
24 hrs
48 hrs
SINO IRON PROJECT
100,000 Litres Diesel Spill
Transhipper
January to February
Department: ENV
Date: 4/05/2009
Sheet Size: A3
Status: Final
Legend
Probability
1%
2%
5%
10%


6 hrs
12 hrs
24 hrs
48 hrs
SINO IRON PROJECT
100,000 Litres Diesel Spill
Transhipper
March to May
Legend
Probability
1%
2%
5%
10%


6 hrs
12 hrs
24 hrs
48 hrs
SINO IRON PROJECT
100,000 Litres Diesel Spill
Transhipper
June to July
Department: ENV
Sheet Size: A3
Status: Final
Legend
Probability
1%
2%
5%
10%


6 hrs
12 hrs
24 hrs
48 hrs
SINO IRON PROJECT
100,000 Litres Diesel Spill
Transhipper
August to December
Legend
Probability

APPENDIX D ENVIRONMENTAL SENSITIVITIES MAP

The shore line categories have been ranked based on their environmental sensitivities, which also determine the priority for protection in the event of a spill.

Shorelines of Low Sensitivity

These include exposed rocky cliffs, exposed artificial structures and exposed low-lying rocky shores and terraces. Low sensitivity is based on the high-energy environment that is usually present. In the best case, waves reflecting off the shoreline keep oil from contacting the shoreline. Rocky shorelines are found at the tip of Cape Preston, around most of Preston Island and close to the mouth of the nearby mangrove creek.

Shorelines of Mid-Level Sensitivity

These are sediment-dominated shorelines which show increasing sensitivity as grain-size increases. Sensitivity in this case entails difficulty of cleanup, and is primarily based on the ability of oil to penetrate into coarser substrates.

Shorelines of Moderately High Sensitivity

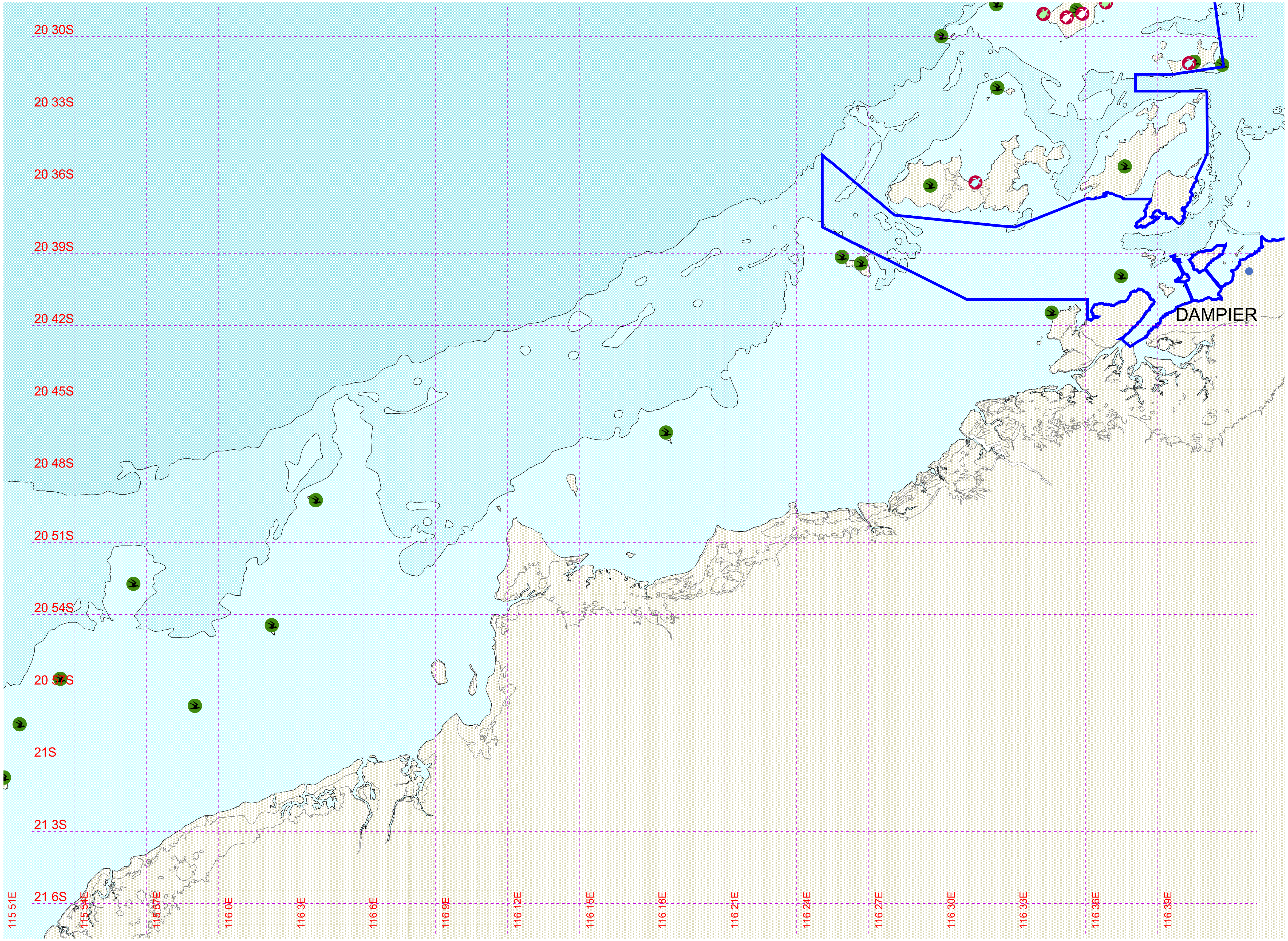
These shorelines consist of exposed tidal flats and sheltered rocky shorelines and are ranked fairly high because of potential biological activity susceptible to oil spill damage. Exposed tidal flats commonly show little to no persistent oil because of little penetration and then movement by wave and tidal activity. On the other hand, oil on sheltered rocky shorelines tends to coat the rocks and algae, causing longterm persistence if not removed. Most of the beaches found at Cape Preston are relatively narrow with shallow intertidal mud flats

Highly Sensitive Shorelines

The most sensitive shorelines are sheltered tidal flats, marshes and mangrove environments. Tall mangrove trees and all associated life could be killed when the base of the tree and its sediments become heavily oiled. Recovery may be longer than that for marshes as years are necessary for the trees to regain their full height after oil concentrations have been sufficiently reduced to enable regrowth.

In the Cape Preston area, mangal area has been observed along the major tidal creek and connective tidal land that joins Cape Preston with the mainland. Other areas of mangal occur in the wider locality, including a generally narrow zone of Avicennia marina which borders the western shoreline and embayments between the creek and the mouth of the Fortescue River.

Cape Preston



8 0 8 16 24 Nautical Miles

Scale 1:316680

LEGEND

5.2.7 - Port limits
1.1.4 - Major coastal populated places in WA
3.5.1 - Turtle nesting sites
Indentified Species Nest Site
Nesting Area
Nesting Site
3.1.5 - Seabirds -General
1.3.1 - Bathymetry Depth contours - all
0-10m
10-20m
20-50m
50-100m
100-200m
200-500m
500-1000m
1000-2000m
2000-5000m
> 5000m
1.1.1 - Detailed Coast

Tuesday, Mar 31, 2009 15:31

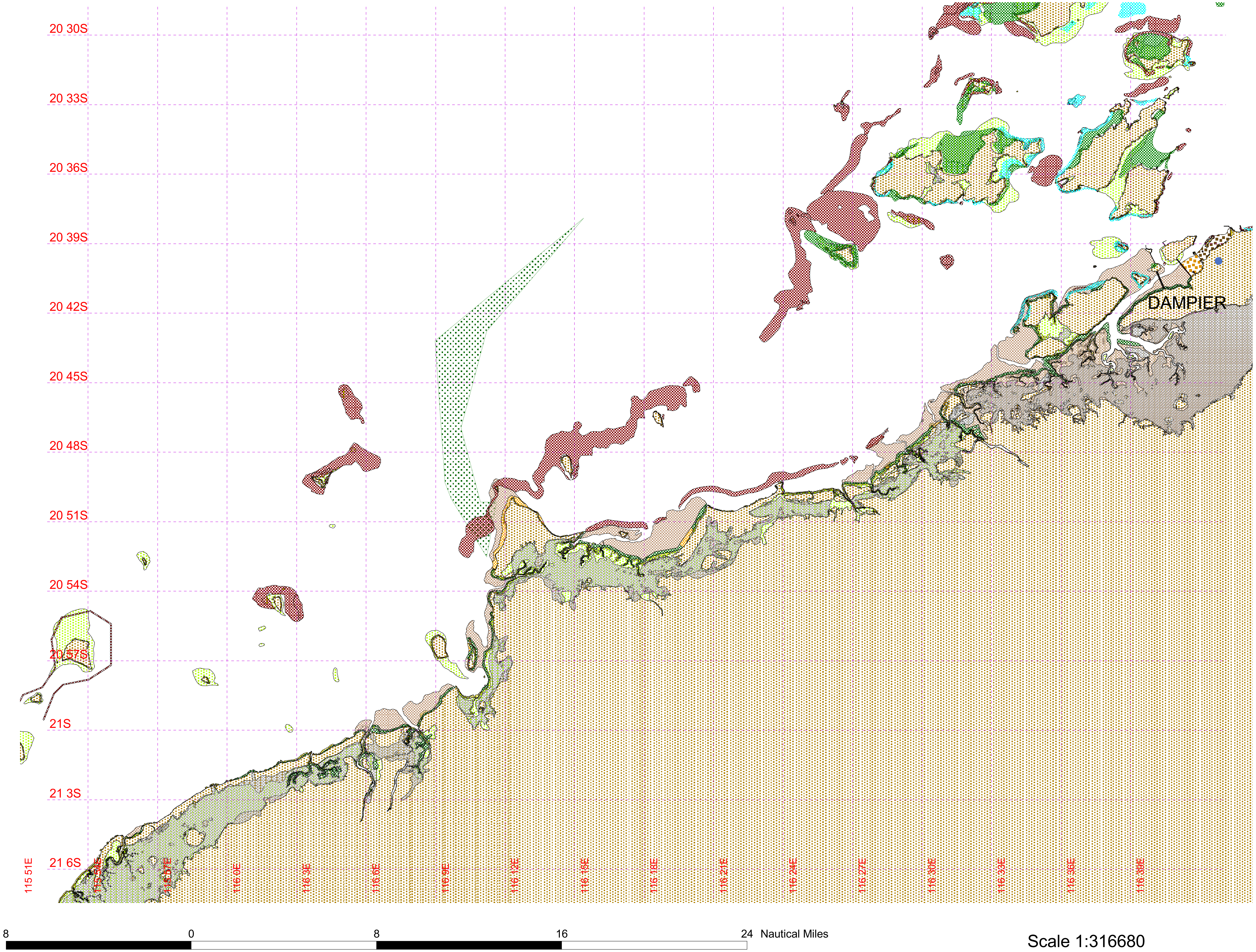
Co-ordinate system - GEOGRAPHICAL
Please note: Distance and area measurements in this co-ordinate system will not be accurate.
Data obtained from various sources.
Licence agreements restricts use to OSRA, with no warranties or undertakings, expressed or implied.
WA DPI copyright.

N

Australian Government
Australian Maritime Safety Authority

GOVERNMENT OF WESTERN AUSTRALIA

Cape Preston



Scale 1:316680

LEGEND

3.4.5 - Macroalgae/Kelp
- Macro Algae

3.4.03 - Reefs Unclassified
- Reef - unclassified
- Reef - coral3.4.3 - Coral reefs
- 1.1.4 - Major coastal populated places in WA
- 2.1.22 - Shoreline Unclassified
- 2.1.21 - Saltpans

2.1.10 - (0.5m) resolution Shoreline classification
- Rocky Cliffs
- Fine to Med Grain Sand
- Rock/Sand
- Unclassified
- Rock/Rubble/Sand
- Sand with Platform
- Platform
- Manmade Seawall
- Rock
- Tidal Flats
- Mainland
- Island
- Mangrove

2.1.05 - Seagrasses
- Dense Seagrass
- Dense Seagrass Patch
- Medium Seagrass
- Seagrass - Unclassified
- Sparse Seagrass
- Seagrass (Indicative)
- 2.1.03 - Sand Beach
- 2.1.02 - Mudflats
- 1.1.1 - Detailed Coast

Tuesday, Mar 31, 2009 15:31

Co-ordinate system - GEOGRAPHICAL
Please note: Distance and area measurements in this co-ordinate system will not be accurate.
Data obtained from various sources.
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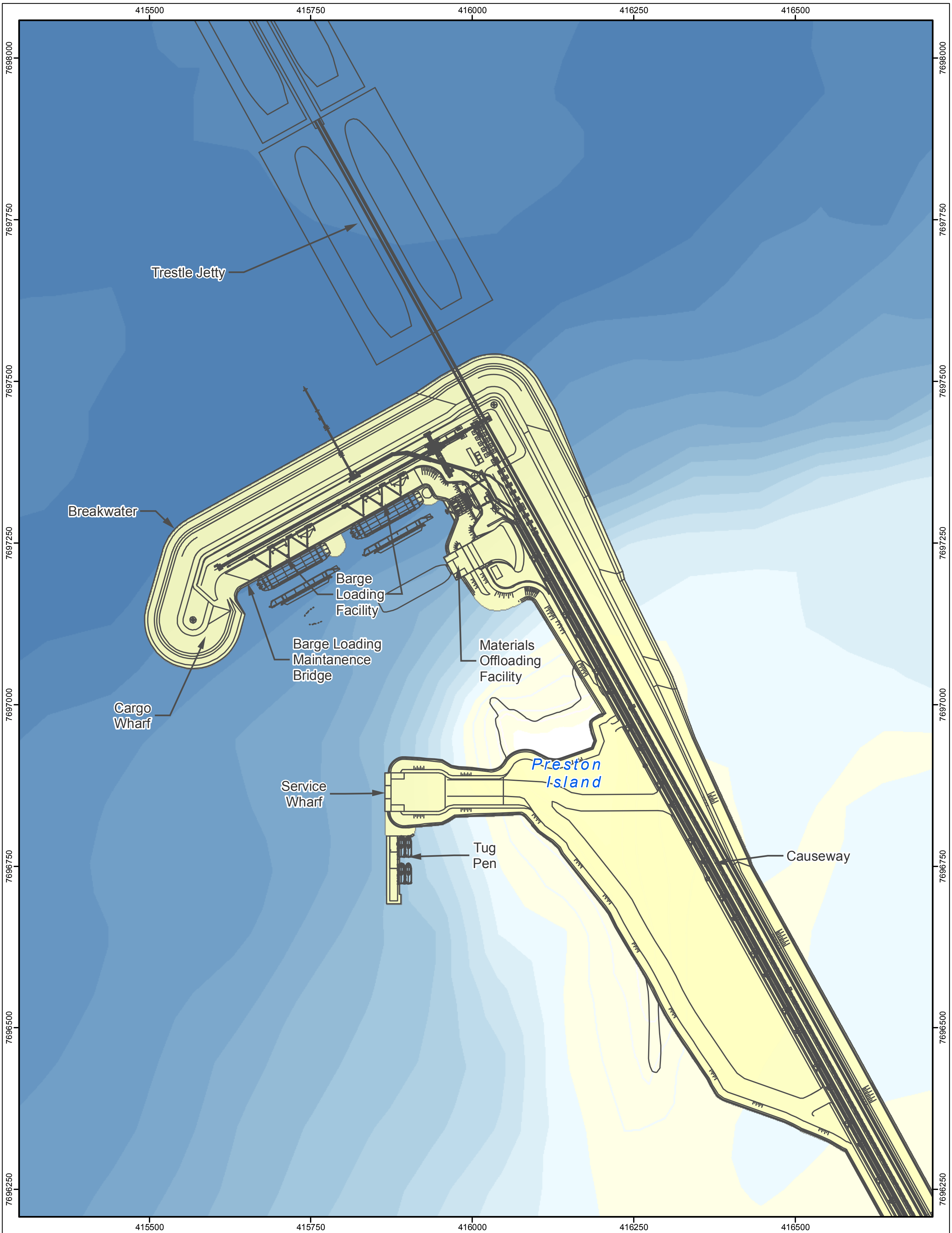
Australian Government
Australian Maritime Safety Authority

GOVERNMENT OF WESTERN AUSTRALIA

APPENDIX E CAPE PRESTON OPERATIONAL MAP



CITIC PACIFIC MINING

SINO IRON PROJECT

Small Boat Harbour Layout

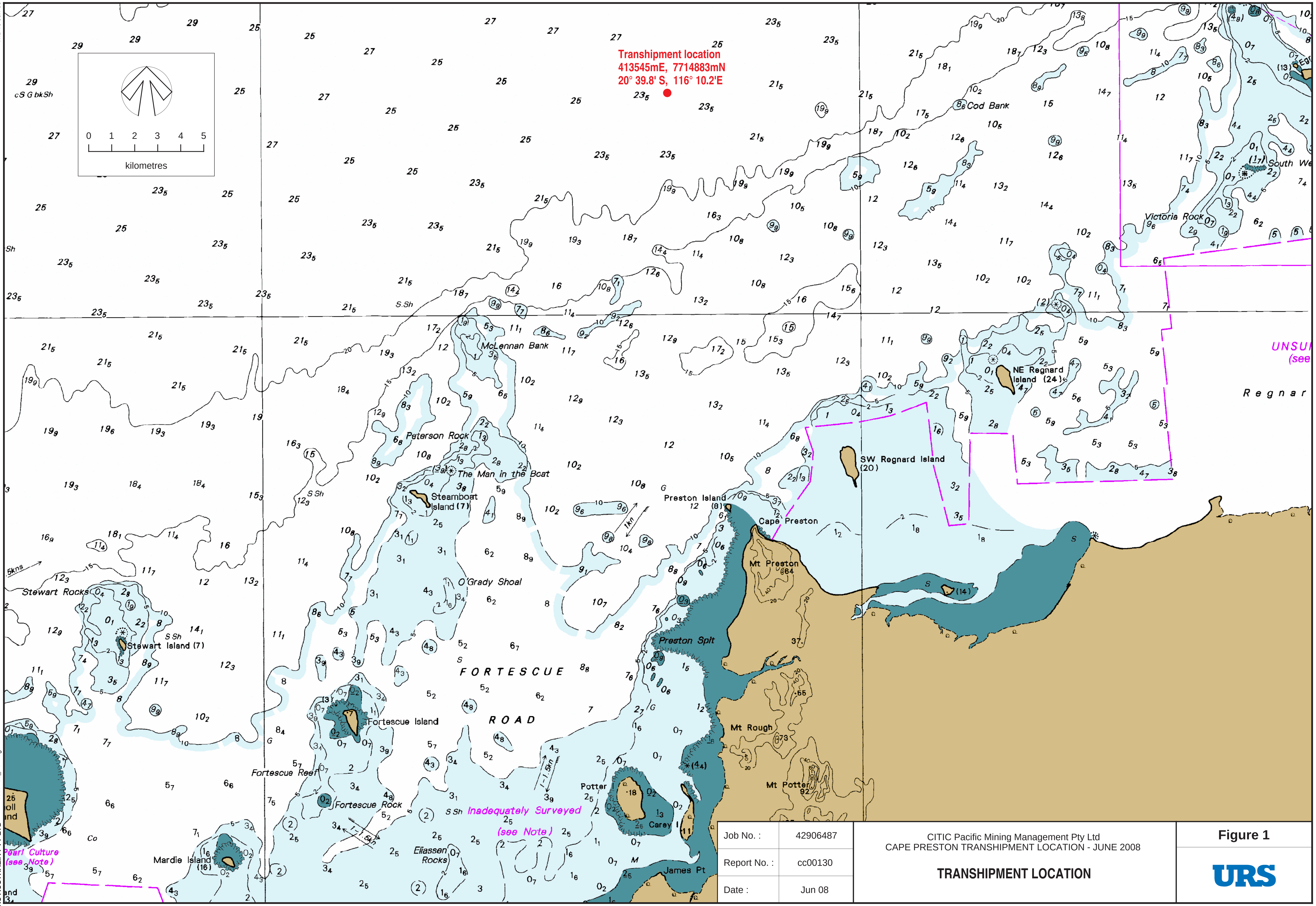
0 75 150 225 300
Meters
1:7,500

Datum: GDA94
Projection: MGA Zone 50

Department:	ENV	Date:	3/06/2011
Sheet Size:	A4	Status:	Final
Drawn by SP	Requested by XL	Internal Reference 2411_00_2011	

Legend

GA Footprint (Version 15)



Job No. :	42906487
Report No. :	cc00130
Date :	Jun 08

CITIC Pacific Mining Management Pty Ltd
CAPE PRESTON TRANSHIPMENT LOCATION - JUNE 2008

TRANSHIPMENT LOCATION

Figure 1

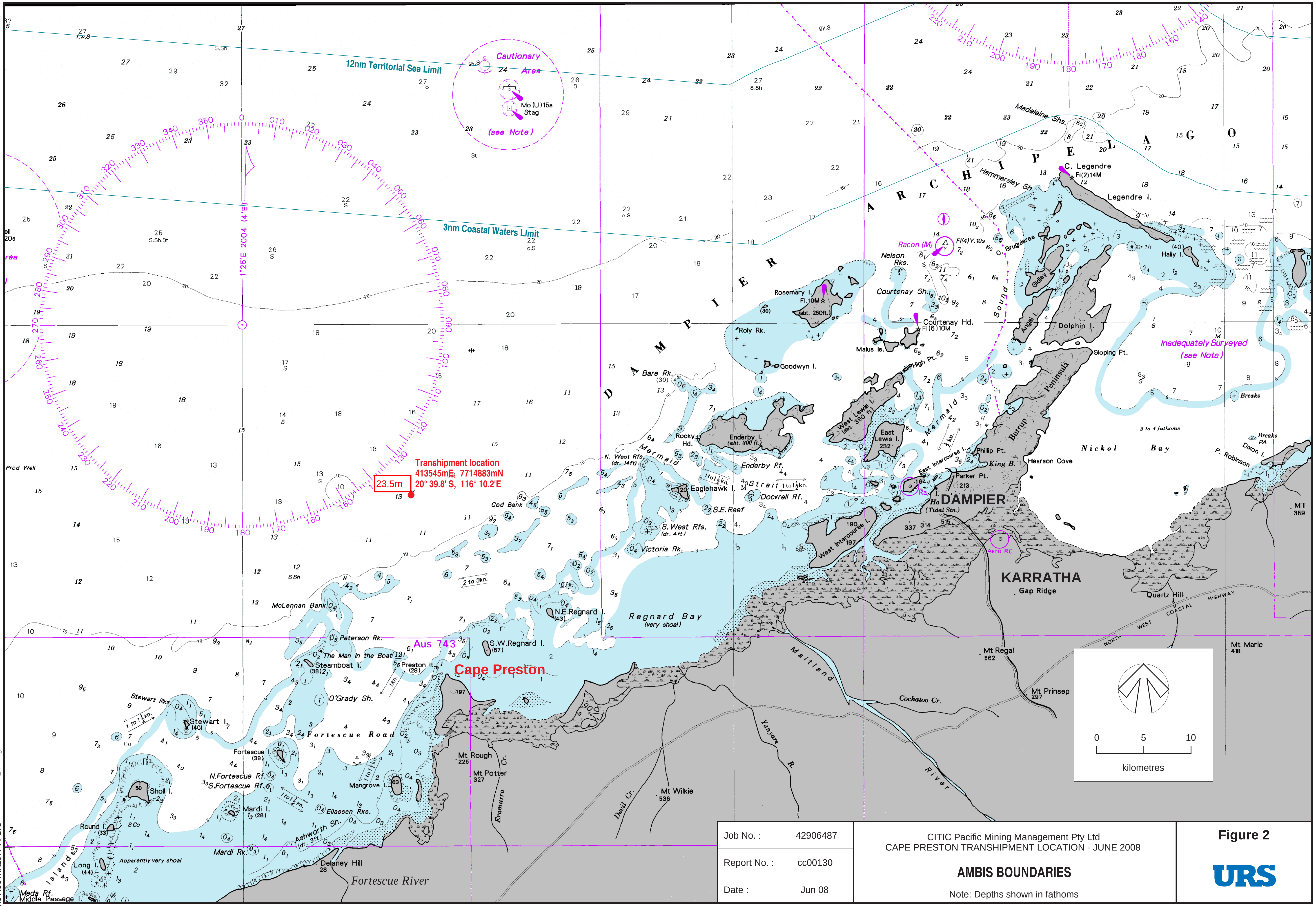
URS

Thu 19 Jun 08

cc00130_F01.dgn

URS AUSTRALIA PTY LTD

Environmental GIS (08) 9486 9222



Job No. :	42906487
Report No. :	cc00130
Date :	Jun 08

CITIC Pacific Mining Management Pty Ltd
CAPE PRESTON TRANSHIPMENT LOCATION - JUNE 2008

AMBIS BOUNDARIES

Note: Depths shown in fathoms

Figure 2

Thu 19 Jun 08

cc00130_F02.dgn

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