timor leste

COVA-1 EXPLORATION DRILLING ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

TL-HSE-PL-005

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Document Title

Cova-1 Exploration Drilling : Environmental Management Plan And Monitoring Program

Abstract:

This Environmental Management Plan and Monitoring Program (EMP) for the Cova-1 drilling campaign was prepared in accordance with *Regulation 51/1993,* Guideline No. 7 *Preparation of an Environmental Management Plan,* a Framework of Reference document submitted to the Direcção Nacional Do Meio Ambient (DNMA), and review comments from the DNMA and other stakeholders.

The EMP provides information on the drilling of the Cova-1 exploration well, its potential environmental and social impacts, and describes Eni's strategies to avoid, minimise and mitigate its impacts.

Rev	Description of Revisions	Date	Prepared by:	Checked by:	Approved by:
1	Issued for use	21 Sep 2010	C Doncon	R Phillips	M Biancone
0	Issued for use	1 Apr 2010	R Phillips	E Mawuli	M Zuvo
A	Issued for internal review	30 Mar 2010	J. Nielsen (Sustainability)	R. Phillips	

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ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Marine Safety Authority
ANP	Autoridade Nacional do Petroleo (National Petroleum Authority)
APPEA	Australian Petroleum Production and Exploration Association
ARPA	Automatic Radar Plotting Aids
AQIS	Australian Quarantine Inspection Service
BOP	Blow-out Preventer
CAMBA	China-Australia Migratory Bird Agreement
CITES	Convention on International Trade in Endangered Species
CMP	Crisis Management Plan
CMS	Convention on Migratory Species
DEMT	Drilling Emergency Management Team
DNMA	Direcção Nacional do Meio Ambient (National Directorate of Environment)
DNPA	Direcção Nacional de Pescas e Aquiculture (National Directorate of Fisheries & Aquaculture
DNPG	Direcção Nacional de Petróleo e Gas (National Directorate of Petroleum & Gas)
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
Eni	Eni Timor Leste S.p.A.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
GDP	Gross Domestic Product
GHG	Greenhouse Gases
HSE	Health, Safety and Environment
IMOP	International Maritime Organisation
IMS	Integrated Management System
IUCN	International Union for the Conservation of Nature
JAMBA	Japan- Australia Migratory Bird Agreement
JPDA	Joint Petroleum Development Area
JVP	Joint Venture Partner
KCl	Potassium Chloride
KPI	Key Performance Indicator
LAT	Lowest Astronomical Tide
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto
NIMS	Non-indigenous Marine Species
NOx	Nitrogenous oxides
ODS	Ozone Depleting Substances
OIM	Offshore Installation Manager
OSCP	Oil Spill Contingency Plan
PHG	Prehydrated gel
PHPA	Partially-hyrolyzed polyacrylamide
PSC	Production Sharing Contract
ROV	Remotely Operated Vehicle
SOI	Southern Oscillation Index
SOx	Sulphurous oxides
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
WBM	Water Based Mud

1. INTRODUCTION

1.1 BACKGROUND

Eni Timor Leste S.p.A. (Eni) proposes to drill the Cova-1 exploration well in Permit Area S-06-03 (Contract Area C). The permit is located in the northern Bonaparte Basin in Timor-Leste sovereign waters, approximately 100km from the southeast coast of Timor Leste, approximately 125km south of Dili and approximately 725km northwest of Darwin.

The well will take approximately 45 days to drill with drilling, due to commence in October 2010. Cova-1 will be drilled by the *Saipem 10000* drillship.

An Environmental Impact Statement (EIS) with respect to the Cova-1 exploration well was submitted to the Direcção Nacional do Meio Ambiente (DNMA) (National Directorate of Environment) for assessment. This Environmental Management Plan (EMP) was prepared for submission to DNMA in accordance with Regulation *No. 51/1993 Environmental Impact Analysis.*

1.2 PROJECT PROPONENT

The proponent of this proposal is Eni Timor Leste S.p.A (Eni). Eni's contact details are:

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Eni is the Operator of the Production Sharing Contract (PSC) covering the Cova field and is also Operator of the Project on behalf of the Joint Venture Partners (JVPs):

- Eni Timor Leste S.p.A. (80%);
- KG Timor Leste Ltd (10%); and
- Galp Exploration and Production (Timor Leste) SA (10%).

The nominated proponent contact for this proposal is:

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Eni is one of the world's major integrated energy companies. In the Timor Sea, Eni has activities in the Joint Petroleum Development Area (JPDA) as well as five PSCs in Timor-Leste's sovereign area. Eni is committed to achieving the highest practicable standard of environmental protection and this commitment is documented in the Eni Health, Safety and Environment (HSE) Policy (Appendix A).

In January 2008, Eni's HSE Integrated Management System (IMS) achieved certification with ISO14001:2004 Environmental Management Systems for its drilling and seismic survey activities. This certification provides audited assurance of a best-practice environmental management system based on continual improvement.

1.3 SCOPE AND OBJECTIVES OF THIS ENVIRONMENTAL MANAGEMENT PLAN

The scope of this EMP is all operational activities relating to the drilling of the Cova-1 exploration well. The overall aim of the EMP is to demonstrate to DNMA that Eni has a sound understanding of how its operations interact with the environment and that it has implemented environmental safeguards to reduce the risks to as low as reasonably practicable (ALARP).

As operator of the PSC and in line with international industry best practice, Eni has prepared this EMP with the following objectives:

- provide a description of the activity (Section 2);
- provide a description of the known environment in the vicinity of the activity (Section 3);
- assess the potential environmental effects and risks associated with the activity (Section 4);
- outline Eni's Environmental Management Strategies for the drilling campaign (Section 5); and
- outline Eni's management system for implementing this (Section 6).

1.4 RELEVANT LEGISLATIVE FRAMEWORK AND ENVIRONMENTAL APPROVAL PROCESS

1.4.1 Environmental Legislative Framework

Permit area S06-03 is regulated by the Autoridade Nacional do Petroleo (ANP) (National Petroleum Authority) under a PSC between Eni and the government of Timor-Leste. Environmental approval of petroleum exploration and production proposals in Timor-Leste is regulated by DNMA.

DNMA Guideline No. 7 *Preparation of an Environmental Management Plan* defines the requirements for an EMP for development proposals. Annex A of Guideline No. 7 describes the required scope and content of an EMP and Annexes B to G describe the environmental and social aspects that should be considered. Table 1.1 outlines the required elements of an EMP under DNMA Guideline No. 7 and the links to relevant sections in this EMP.

Table 1.1 Links between this EMP and the requirements of Guideline No. 7

DNMA Guideline No. 7		Cova-1 EMP
I.	Project Description	Section 2: Description of the Operations
II.	Physical, Biological and Social Impacts and Mitigation Measures	Section 4: Environmental Risk Assessment Section 5: Environmental Management Strategies Section 6: Implementation Strategy
III.	Monitoring, Reporting and Auditing Schedule	Section 6.6: Environmental Management Monitoring, Reporting and Auditing
IV.	Organisation and Management Structures.	Section 6.4: Chain of Command and Roles and Responsibilities
V.	Resources	Section 6.3: Systems, Practices and Procedures
VI.	Capacity Building and Training	Section 6.5: Training, Awareness and Competence
VII.	Declaration of Compliance	Submitted with EMP

1.4.2 Other Legislative Requirements

As stated in Eni's HSE policy (Appendix A), Eni shall ensure that it conducts its operations in accordance with legislative requirements. To achieve this, Eni maintains a database that describes legislation relevant to the environmental management aspects of its operations. Eni shall ensure that the Cova-1 drilling campaign complies with all relevant Acts and regulations.

Table 1.21.2 highlights the most significant legislation and licence requirements in respect of the environmental considerations relating to Eni's operations. Eni reviews the environmental legislation database annually or when significant environmental legislation changes occur. The annual review will be confirmed during an annual environmental audit of Eni operations.

Table 1.2 Relevant Legislation, Codes of Practice and International Agreements for the Drilling Campaign

International Agreements and Legislation
United Nations Convention on the Law of the Sea 1982.
International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (commonly known as MARPOL 73/78) and implemented in Australia through the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*).
Protocol to International Convention for the Prevention of Marine Pollution by Dumping of Waste and Other Matter 1972 (commonly known as the 1996 Protocol).
Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment 1986 (commonly referred to as CAMBA).

Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment 1974 (commonly referred to as JAMBA).
Republic of Timor-Leste Legislation
Maritime Zones Act 2002.
Timor-Leste Petroleum Act 2004.
DNMA Guideline #5 on Public Engagement
DNMA Guideline #6 on Environmental Screening
DNMA Guideline #7 on Preparation of an Environmental Management Plan
Indonesian Legislation and Regulations in effect on 25 October 1999
Law 23/1997 on Environmental Management
Reg. 20/1990 on Control of Water Pollution
Reg. 51/1993 on Environmental Impact Analysis
Industry Codes of Practice and Guidelines
Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice 1996: This provides guidance on a set of recommended minimum standards for petroleum industry activities offshore. These standards are aimed at minimising adverse impact on the environment, and ensuring public health and safety by using the best practical technologies available.

1.5 STAKEHOLDER CONSULTATION

External consultation was initiated by Eni's consultation with DNMA and submission of the draft Framework of Reference (FoR) on 24 November 2009. The purpose of this consultation was to inform DNMA on the scale and nature of the Cova-1 drilling program, clarify the environmental approvals process and present Eni's draft Framework of Reference for the EIA. Eni arranged a public forum in Timor Leste on 23 February 2010 as a Screening Workshop to introduce the drilling program to a wider group of stakeholders, identify any early concerns and answer questions.

Subsequently, Eni developed Revision 0 of the EIS and EMP, and distributed these to the DNMA and stakeholders for review. A Stakeholder Review workshop was held in Timor-Leste on 24 August 2010 to provide updates on the drilling program and answer further queries from stakeholders. Formal written submissions on the EIS and EMP from stakeholders were collected by the DNMA and have been incorporated, where necessary, into this document, Revision 1 of the EMP (the final EMP).

2. DESCRIPTION OF THE OPERATIONS

2.1 FIELD LOCATION

The Cova-1 exploration well is located in PSC S06-03, situated in the northern Bonaparte Basin within Timor-Leste waters (Figure 2.1). It is located approximately 100km from the southeast coast of Timor Leste, approximately 125km south of Dili and approximately 725km northwest of Darwin. The geographical coordinates of the Cova exploration well are presented in Table 2.12.1.

Table 2.1: Geographical Coordinates of the Proposed Cova-1 Well

Well	Latitude	Longitude
Cova-1	10°01'59.24" S	125°45'58.85" E

2.2 PREVIOUS ACTIVITIES IN THE PERMIT AREA

Oil exploration activities in the Timor Sea commenced in the late 1960s. Since this time numerous wells have been drilled throughout the region, resulting in finds for Eni, OMV, BHP Billiton Petroleum, Santos, TCPL Resources, Norcen International, Peko Oil, Western Mining Corporation, BP, Shell and Woodside Energy. The Bayu-Undan gas field currently operates within the JPDA, and the Laminaria/Corallina oilfield operates nearby. Eni's Kitan Development in the JPDA is expected to commence production in 2011.

Searches for new sources of hydrocarbons are actively being pursued in the region. The petroleum exploration and production industry is a significant stakeholder of offshore waters in the region, particularly within and adjacent to the JPDA between Timor Leste and Australia.

No wells have been drilled in PSC S06-03. However, the permit area was covered by an extensive grid of 3D seismic data acquired in June 2007 (ENI 2007).

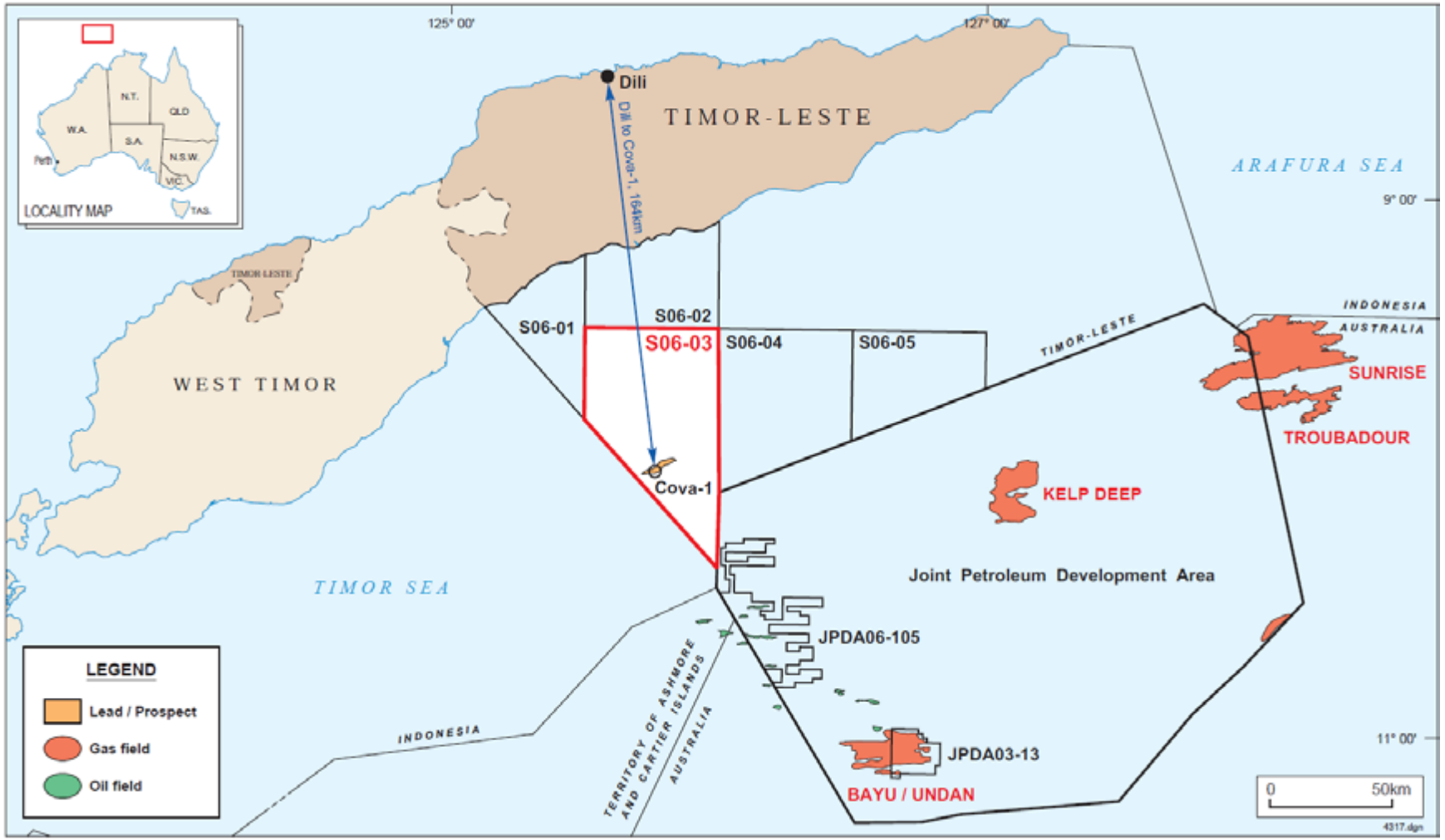

Figure 2.1 Cova-1 Well Location

2.3 PROPOSED DRILLING PROGRAM

The proposed Cova-1 well will be drilled as a vertical exploration well. Drilling will be undertaken using the drillship, *Saipem 10000*. The specifications of the *Saipem 10000* are presented in Appendix B.

On arrival at site, the drillship will move into position and remain in position using the Class III Dynamic Positioning system. Table 2.22.2 outlines the drilling programme for the Cova-1 exploration well and Figure 2.2 presents the well schematic diagram.

Drilling is scheduled to commence in October 2010. The drilling program is scheduled to take 45 days to complete.

Table 2.2: Drilling Program for the Cova-1 Exploration Well

	Activity
1	Mobilisation to Cova-1
2	Positioning
3	Spud in - Drill 26" x 42" hole to 2225m
4	Run and cement 36" x 20" Dual Casing
5	Run and Latch Blow Out Preventer (BOP) on wellhead and Test BOP
6	Drill 16" hole from 2225m - 3405m
7	Run and cement 13-3/8" casing
8	Drill 12-1/4" hole from 3405m - 3900m
9	Wireline Logs
10	Run and cement 9-5/8"
11	Drill 8-1/2" hole from 3900m to 4205m
12	Wireline Logs
13	Abandonment and Retrieval of BOP and Wellhead
14	Demobilisation

Figure 2.2 Cova-1 Well Schematic

2.4 DRILLING FLUIDS AND CUTTINGS

Drilling will occur in sections of decreasing hole diameter. During drilling, mud is pumped down the drill pipe to the drill bit. On completion of the upper hole sections, steel pipe (casing) is inserted into the hole and the annular space between the casing and hole filled with cement. The upper sections will be drilled without a riser, using seawater and high viscosity sweeps. During riserless drilling operations, the drill cuttings (approximately 320m^3) will be discharged directly to the seafloor.

A high-pressure wellhead will be installed for each well. Once the wellhead is in position, the blow-out preventer (BOP) is latched to it. In this instance, the BOP is installed on the seafloor and connected to surface by the riser, which allows for rig movement at the ocean surface and for drilling mud to be circulated from the wellbore back to the rig.

Once the riser is installed, the remaining hole sections are drilled. With the riser in place, drilling mud is circulated for reuse, with mud returned to equipment on the rig where it is processed to retain the fluids prior to disposing of the cuttings at the sea surface (approximately 20m^3).

Water-based mud (WBM) will be used for all hole sections. Eni proposes to drill the top section of the wells riser-less using seawater and prehydrated gel (PHG) sweeps. The bottom section of the wells would be drilled using a partially-hydrolyzed polyacrylamide (PHPA) water based gel with KCl as the clay stabiliser and weighting agent. Both the PHG and PHPA gels have low toxicities, degrade rapidly in the marine environment and are routinely accepted for use by the regulatory authorities (Hinwood *et al*, 1994). The amount of drilling fluids disposed of with cuttings is minimised by the solids control processing system aboard the rig, and will be around 15% of the total WBM volume used in the drilling program.

While drilling, the specific gravity of drilling fluid (and hence pressure) will be maintained above the formation pressure. The higher pressure differential will cause the invasion of drilling fluid into the reservoir, forcing any hydrocarbons away from the well bore. As a result, there will be little opportunity for any hydrocarbons to mix with the drill fluid returns.

2.5 SOLIDS CONTROL PROCESSING SYSTEM

The drilling mud is pumped from tanks on the drillship down the inside of the drill string and through the drill bit. It carries the drill cuttings from the bit up the annulus between the drill string and the well bore to the surface and into the drilling fluid handling system on the drillship. The drilled cuttings are removed from the drilling fluid and the fluid is reconditioned before it is returned to the drilling fluid circulation system. This is achieved with a solids control processing system.

The solids control processing system is composed of the following components:

- Shale shaker—vibrating screens are used for the primary separation of drilled solids of a size greater than about 70 microns
- Desander and desilter

- Centrifuges—high speed barrel type centrifuges used to remove solids as a fine as 2 microns
- Dryers—a low speed centrifuge that removes fluid from cuttings.

When the riser is attached and a closed drilling fluid circulation system established, the solids from the solid control system will be disposed overboard on a continuous basis. As mentioned in Section 2.4, around 15% of the WBM used in the drilling program will adhere to the drill cuttings and will also be discharged overboard. Solids will be flushed with seawater through a discharge line which discharges into the sea below the hull of the ship.

Drilling muds used for drilling the reservoir hole section will be recovered and stored once the well has been drilled. This avoids dumping mud at end of a well, a typically practice in the Australian waters. This improved practice will considerably improve the environmental requirements of the project and eliminate possible discharge of contaminants into environment prior to suitable treatment.

2.6 CORE SAMPLE

If hydrocarbons are encountered, a 27m core may be cut.

2.7 WIRELINE EVALUATION

If hydrocarbons are encountered a full wireline formation evaluation will be performed. The well will then be plugged and abandoned.

2.8 FLARING

Flaring will not be undertaken during normal drilling activities at Cova-1, as the well is not planned to be “tested” (during well testing, hydrocarbons are brought to the surface and flared off, to assess flows from the reservoir).

If small pockets of hydrocarbons (e.g. gas) are encountered during drilling, emergency flaring may be required through a relief flare. This would involve low volumes of hydrocarbons, over short periods only.

2.9 DRILLING SUPPORT

Drilling support will be provided by the platform supply vessel *Sea Witch*, based in Darwin and owned by Deep Sea Supply Pty Ltd and under contract with Eni during the Cova-1 drilling operations. The specifications of the *Sea Witch* are presented in Appendix C. *Sea Witch* will conduct supply services from Darwin to the Cova-1 well site. A supply vessel will be transiting on average twice per week between Darwin and the Cova-1 well location.

A second support vessel shall be stationed on site throughout the drilling program. The second support vessel is yet to be selected however will be sourced from Darwin.

Helicopter support will be based at Dili (as will service crew changes), with connection between Dili and Darwin by fixed wing aircraft. Eni's drilling team will operate from the company's Perth office.

2.10 WELL CONTROL PROCEDURES

Eni's Well Control Procedures are based on three key elements. These include:

- thorough assessment of the geology and formation pressures prevalent in the area;
- design of the drilling fluid programme; and
- well control procedures used by the drilling contractor.

Eni's drilling programme will fully incorporate these three key well control elements to provide an industry 'best practice' approach to well control. This will include training and accreditation of both the drilling contractor's and operator's site supervisory personnel.

2.11 OPERATIONAL WASTES

Routine drilling operations generate the following types of waste:

- drill cuttings, discharged overboard continuously during drilling after screening to separate the drilling fluids;
- drilling fluids/muds are generally discharged overboard at the end of various hole sections and at the completion of the well;
- the *Saipem 10000* will have containment zones and bunding in all areas where oil products are stored and oily residues will be stored in drums and shipped onshore for disposal at authorised sites. Minor deck spills will be washed with bio-degradable detergents and polluted deck drainage water will be collected in a settling tank for later disposal onshore in Australia;
- sewage, grey water and putrescible wastes discharged overboard after treatment;
- cooling waters, discharged overboard continuously during drilling;
- domestic and industrial solid wastes and hazardous solid and liquid wastes, collected and segregated on the drillship for transport to shore for appropriate disposal at intervals during drilling; and
- engine and waste oil, which will be collected, as per the *Saipem 10000* Waste Management Plan and transported to Australia for appropriate onshore disposal.

Waste disposed of onshore in Australia will be received at Shorebase's supply base in Darwin. Hazardous waste (as defined in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal) requires an import permit as per the Commonwealth of Australia's *Hazardous Waste (Regulation of Exports and Imports) Act* 1989. Accordingly, an assessment is required to be made of the waste prior to disposal. Both the hazardous and non-hazardous wastes are collected by Veolia for disposal to appropriately licensed facilities.

2.12 DRILLING SAFETY

Eni conducts drilling operations in accordance with the Eni corporate worldwide standards. These standards adopt best practices and are continually revised to ensure that wells are drilled safely without incident. This process includes analysis of drilling incidents in the worldwide petroleum industry, to incorporate learnings into Eni standards wherever possible. All well designs for deep water applications (>500m water depth) are approved by Eni headquarter divisions to ensure they comply with the standards.

A Vessel Safety Case for the *Saipem 10000* has been prepared and submitted to the ANP for approval. The drilling vessel is being inspected by third party auditors to provide an independent report on the condition of the rig and the rig's adherence to its safety documents and maintenance requirements. A scope of validation and a validation report, which addresses the rig's compliance to various standards, is also reviewed by the ANP through a Timor-Leste government approval process, in accordance with legislation.

Most wells within the nearby JPDA show a normal pressure regime down to total depth (e.g. Kitan-1 and -2, Capung-1a, Jahul-1, Krill-1, Kuda Tasi-1, -2 and -3). Blow-out preventers (BOPs) will be used prior to the intersection of any hydrocarbon zones.

Casing sizes and lengths and the intervals where the hole is cement sealed around the casing will be selected to maximise well control. Experience gained with previously drilled offshore exploration wells will be taken into consideration in the well design.

The positioning and operation of the drillship will be closely supervised by the Drilling Contractor's personnel and the Eni Drilling Supervisor. During the drilling programme, a temporary safety exclusion zone with a radius of 500m around the drillship will be declared and appropriately gazetted. Few vessels are expected to be operating in the area, but those that do will be informed of the location of the drillship and the exclusion zone by radio.

An Emergency Response Plan (ERP) is contained within the *Saipem 10000* Safety Case, and details the procedures to be followed in the event of an emergency (including an oil spill). An Oil Spill Response Manual (OSRM) is also under preparation, which provides background on appropriate oil spill response strategies for the S06-03 permit area. Both documents will be introduced in the environmental induction process undertaken by all employees and contractors.

3. DESCRIPTION OF THE ENVIRONMENT

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

Regional Overview

The Timor Sea has two distinct seasons: "winter" from April to September and "summer" from October to March. The short period between the two seasons is termed the transition season. During this period, either winter or summer regimes could dominate.

The "winter" dry season (April to September) is characterised by steady easterly (northeast to southeast) winds of 5 to 13ms^{-1} driven by the South East Trade Winds over Australia. Figure 3.1 shows the general atmospheric circulation pattern over the Timor Sea during winter.

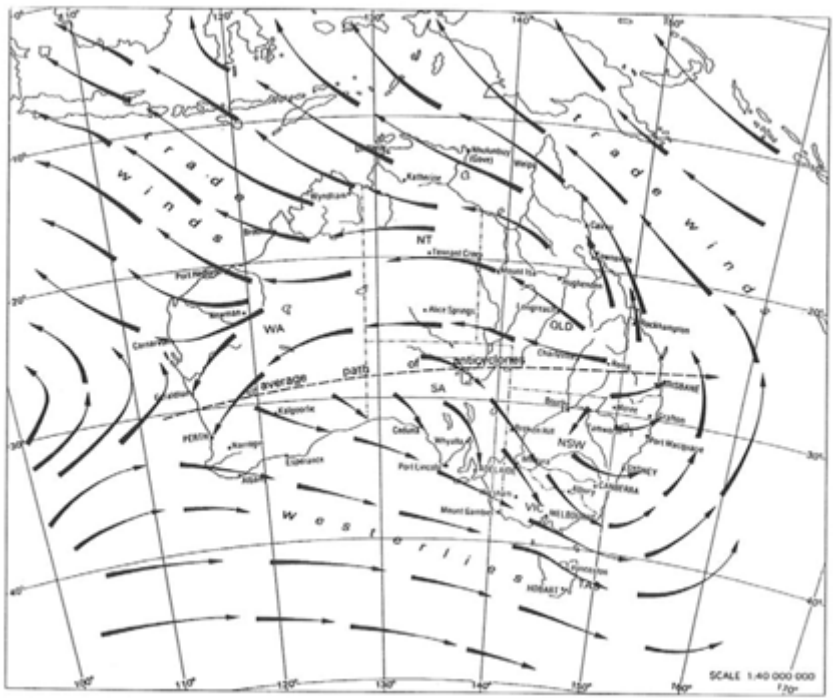

Figure 3.1 Generalised Atmospheric Circulation over Australia in Winter (July) (from Swan *et. al.* 1994)

The "summer" season (October to March) is the period of the predominant North West Monsoon. It is characterised by mostly westerly (west-southwest) winds of 5ms^{-1} for periods of 5 to 10 days with surges in the airflow of 10 ms^{-1} to 18ms^{-1} for the period of 1 to 3 days. Figure 3.2 shows the general atmospheric circulation pattern over the Timor Sea during summer.

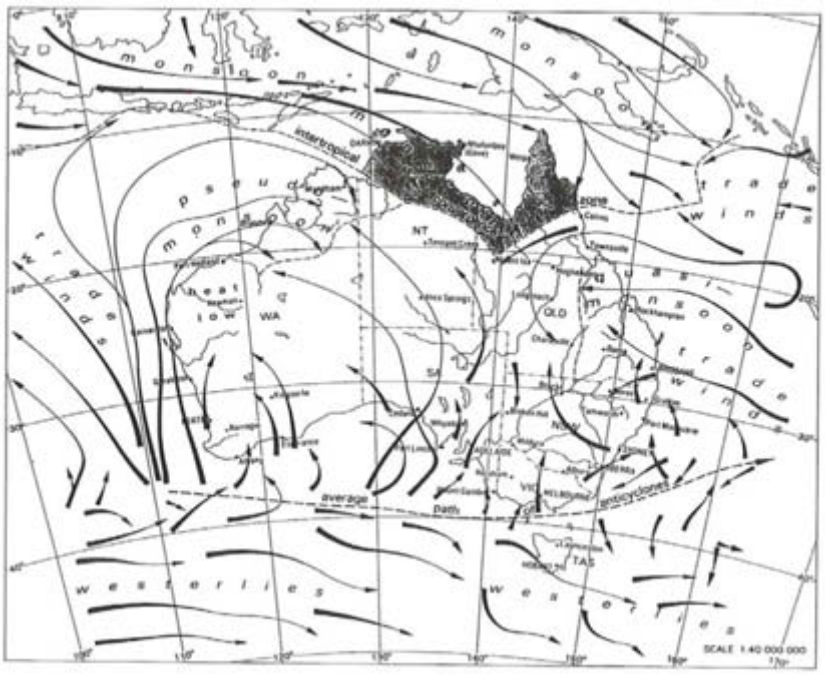

Figure 3.2 Generalised Atmospheric Circulation over Australia in Summer (January) (from Swan *et. al*. 1994)

Tropical cyclones can develop between November and April resulting in short lived, severe storm events often with strong but variable winds. Figure 3.3 shows the cyclone tracks logged over a 36 year period that cross within 200km of the drilling location.

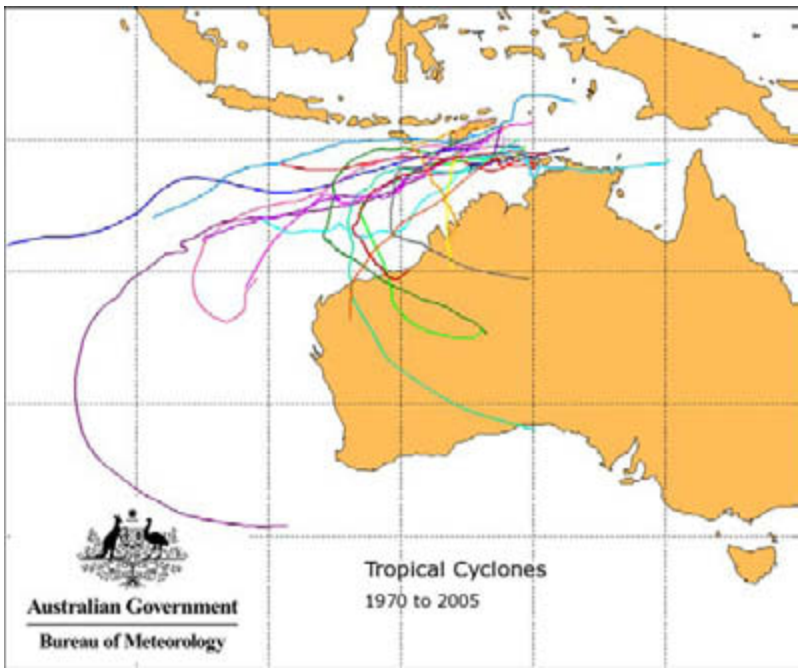

Figure 3.3 Tropical cyclones crossing within 200km of 10° 15' 45.19"S 125° 55' 58.65"E (1970 to 2006) (BOM 2009)

Rainfall and Temperature

Mean annual rainfall in the region is 1,700mm. Almost all rainfall occurs between November and April, the greatest falls being in January and February. The frequency and severity of the thunderstorms produce a large variation in the monthly rainfall. Rainfall during the dry months is sporadic and light.

Mean air temperatures are 26.9°C in July and 28.4°C in December.

Wind Patterns

Joint frequency distributions were calculated from 10 complete years (July 1997 – Jun 2007) of verified NCEP ambient modelled data for the Cova-1 location. Wind roses for the winter, summer and transitional seasons are presented in Figure 3.4. These display the expected seasonal variation in prevailing wind direction, with westerlies (southwest-northwest) persisting from October to March, and a fairly rapid shift to easterlies (northeast – southeast) in late March or early April that then persist until late October or early November before the return to the westerlies.

3.1.2 Oceanography

Currents and Tides

The main forces contributing to surface water movement at the Cova-1 location are:

- general oceanic circulation;
- astronomical tides; and
- wind stress.

The Pacific – Indian Throughflow flows south through the Indonesian Archipelago and into the Eastern Indian Ocean bathing it in warm, relatively low salinity seawater (Figure 3.5). At the Cova location, this may add a westerly component to the current regime. Current speeds vary depending on the season. Lowest speeds would occur in April at the end of the northwest monsoon when winds blow towards the Pacific whilst highest speeds would occur in September associated with the southeast monsoon (Wijffels et al., 1996).

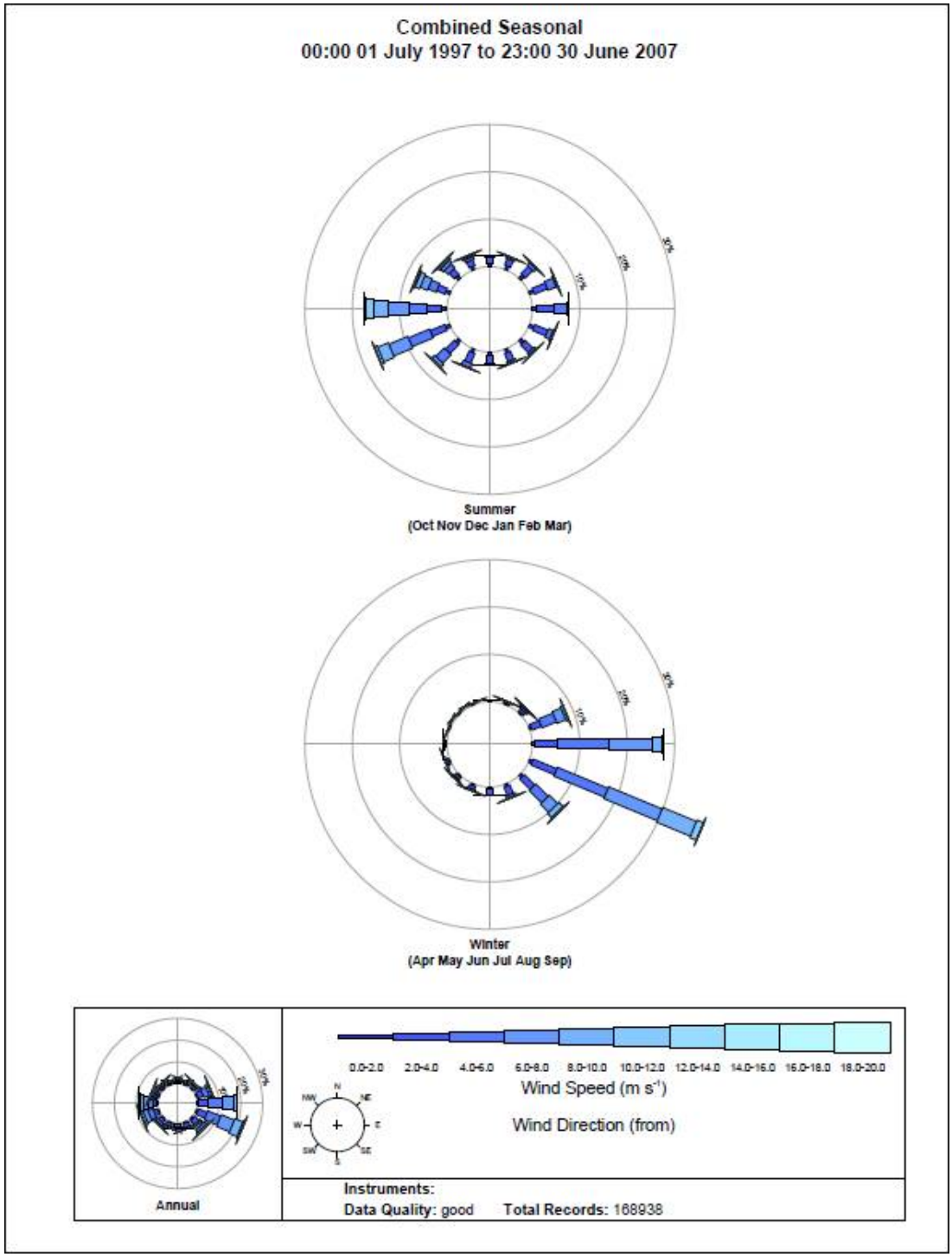

Figure 3.4 Seasonal wind roses for the Timor Sea (Saipem Energy Services, 2009)

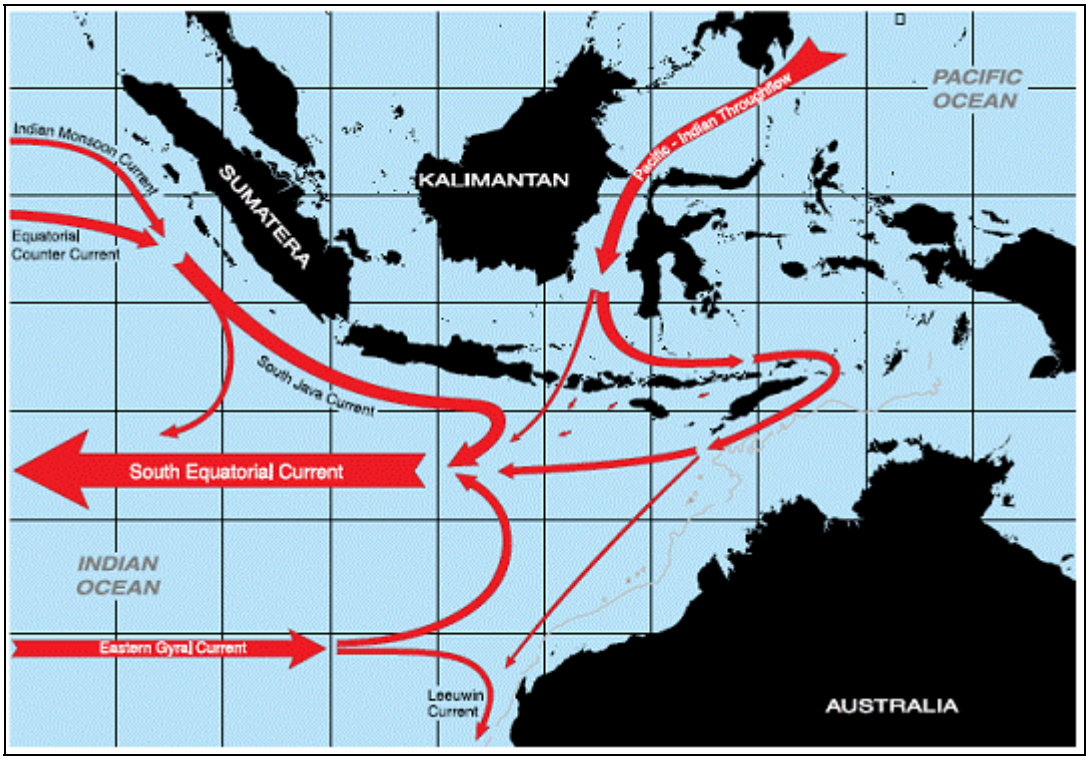

Figure 3.5 Regional Currents (CSIRO, 2004)

Tidal currents in the region are anti-clockwise rotational, commencing flood towards the NE and ebb towards the SW. Speeds will range from about 0.02m/s on neap tides to 0.1m/s on springs.

Surface currents are expected to reflect seasonal wind regimes (Figure 3.4). Local wind-driven surface currents may attain maximum speeds of $0.7ms^{-1}$ during extreme wind surges. More typically speeds would be in the range of $0.2ms^{-1}$ to $0.4ms^{-1}$.

The tides in the vicinity of the proposed Cova-1 well are semidiurnal (two highs and lows each day) with a slight diurnal inequality (difference in heights between successive highs and low). There is a well defined spring-neap lunar cycle, with spring tides occurring two days after the new and full moon. Table 3.1 provides the standard tidal levels for the Cova-1 Field. Highest Astronomical Tide (HAT) is 3.25m and the mean ranges for spring and neap tides are 2.08m and 0.58m, respectively.

Table 3.1: Standard tide levels for Cova-1 (Fugro, 2009)

Tidal state	Level (m)
Highest Astronomic Tide (HAT)	3.25
Mean High Water Springs (MHWS)	2.65
Mean High Water Neaps (MHWN)	1.90
Mean Sea Level (MSL)	1.61
Mean Low Water Neaps (MLWN)	1.32
Mean Low Water Springs (MLWS)	0.57
Lowest Astronomic tide (LAT)	-0.07

Sea and Swell

Waves at the proposed Cova-1 well location comprise contributions from:

- Southern Ocean swells;
- summer monsoonal swells;
- winter easterly swells; and
- locally generated seas.

The most persistent swell will arrive from the west and southwest with typical heights of 2m in winter and 1m in summer. Since longer period swell suffer less dissipation, periods of long-travelled swell commonly reach 18 seconds and occasionally exceed 20 seconds.

Shorter period swell (6 to 10 seconds), may result from tropical cyclone, winter easterlies over the Arafura Sea and the eastern portions of the Timor Sea, and summer westerlies over the western portions of the Timor Sea.

Local wind generated sea is highly variable but typically ranges in period from 2 seconds to 6 seconds with heights of up to 6m in strong persistent forcing at some locations (Swan *et al*, 1994).

Seawater Profile

A baseline environmental survey of the JPDA 06-105 permit area, located around 20 km south of permit area S06-03, was conducted by Gardline Marine Sciences Pty Ltd (Gardline) in May 2010. Physico-chemical characteristics of the seawater column were sampled at three sites using a YSI 6600 multi-parameter probe, which measured pH, temperature, conductivity and dissolved oxygen (DO). Profiles were taken during day and night at all sites, down to water depths of 200m.

Surface seawater temperatures recorded were between 29.0 and 29.6°C. Subsurface temperatures were steady to approximately 60m depth. Below this, temperatures dropped steadily, indicating a consistent thermocline among all sampling sites. At depths close to 200m, temperatures reached as low as 12.4°C. This pattern of vertical stratification is typical of tropical seas (Gardline 2010).

The other parameters showed similar stratification:

- salinity levels were lower in the surface mixed layer (34.0–34.2ppt) and showed a consistent halocline from around 60m, with increasing salinity at depth (up to 34.6ppt at 190m depth).
- surface DO concentrations were above 6.0 mg/L, supportive of marine life, then showed a consistent decline to 60 m depth, after which concentrations decreased substantially to as low as 3.5 mg/L at 190 m depth.
- pH levels were consistent at around 8.1 in the well-mixed surface waters down to 60m, and then decreased to below 7.8 at 190 m (Gardline 2010).

These results are consistent with those previously recorded by Creswell et al (1993) in the Timor Sea.

Information on seawater temperature and salinity was also compiled from historical records by Fugro Survey Pty Ltd (Fugro). Surface sea temperatures ranged from about 30°C in summer to 26°C in winter. Table 3.2 presents monthly minimum, maximum and mean surface temperatures. Seawater temperature and salinity depth profile data are given in Table 3.3 and Table 3.4 respectively.

Table 3.2: Monthly and All-year Surface Seawater Temperature Statistics (Fugro, 2009)

Combined period (1955 to 2009)	Seawater temperature at surface (°C)		
	Minimum	Mean	Maximum
January	25.00	29.46	32.10
February	25.00	29.29	32.00
March	26.00	29.71	33.00
April	26.00	29.22	33.00
May	25.00	28.65	32.00
June	24.60	27.83	31.00
July	23.00	26.61	30.00
August	24.50	26.70	29.70
September	23.50	27.34	29.50
October	24.00	28.31	31.00
November	25.00	29.46	32.50
December	25.00	29.69	33.90
All-Year	23.00	28.74	33.90

Table 3.3: All-year Seawater Temperature Profile (Fugro, 2009)

DEPTH (m)	SEAWATER TEMPERATURE		
	MIN (°C)	MEAN (°C)	MAX (°C)
0	25.5	28.8	33.4
10	25.5	28.4	31.5
20	25.4	28.1	30.6
30	24.2	27.7	30.1
50	22.2	26.9	29.1
75	20.4	25.7	28.7
100	18.3	23.9	28.5
125	16.3	21.7	28.2
150	14.9	19.3	23.1
200	12.6	15.8	19.2
250	10.9	13.2	16.1
300	9.6	11.5	13.5
400	8.1	9.3	10.3
500	7.2	7.9	8.9
600	6.5	7.0	7.8
700	6.0	6.3	6.9
800	5.5	5.8	6.1
900	4.9	5.2	5.6
1000	4.5	4.8	5.1
1100	4.2	4.5	4.8
1200	3.9	4.2	4.5
1300	3.7	4.0	4.2
1400	3.5	3.8	3.9
1500	3.3	3.6	3.7

Table 3.4: All-year Seawater Salinity Profile (Fugro, 2009)

DEPTH (m)	SALINITY		
	MIN (PSU)	MEAN (PSU)	MAX (PSU)
0	33.95	34.49	34.94
10	33.95	34.49	34.81
20	33.98	34.49	34.77
30	34.06	34.50	34.75
50	34.20	34.53	34.74
75	34.33	34.56	34.77
100	34.32	34.62	34.80
125	34.38	34.70	34.83
150	34.51	34.74	34.85
200	34.57	34.69	34.81
250	34.47	34.60	34.70
300	34.44	34.55	34.64
400	34.48	34.54	34.58
500	34.52	34.55	34.59
600	34.54	34.56	34.58
700	34.55	34.56	34.57
800	34.56	34.56	34.57
900	34.57	34.57	34.57
1000	34.57	34.58	34.58
1100	34.58	34.58	34.59
1200	34.58	34.59	34.61
1300	34.59	34.61	34.62
1400	34.61	34.63	34.64

3.1.3 Bathymetry

The proposed Cova-1 exploration well is located on the continental slope in an area of uniformly smooth seabed ranging in depth 1,900m to 1,950m (Figure 3.6). To the north the continental slope continues to decline steadily reaching depths in excess of 2,500m in the Timor Trough.

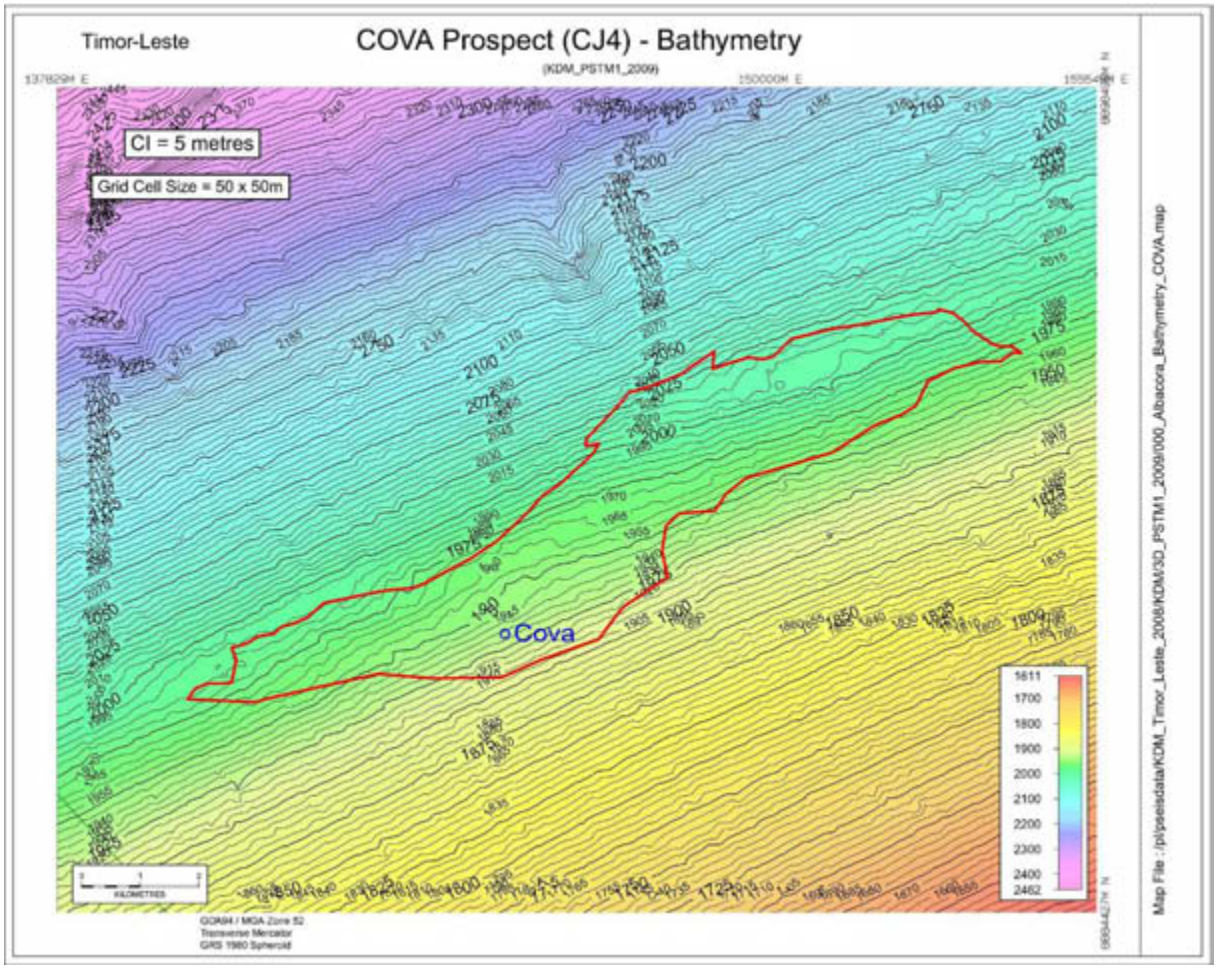

Figure 3.6 Bathymetry of the Cova well location

Approximately 80km to the south of the Cova-1 well, the Sahul Shelf extends approximately 300km out from and runs parallel to the northern Australian coastline (Figure 3.7). A system of shoals occurs to the south and southwest of the Cova-1 location (Figure 3.7). The system stretches for approximately 60km in a northeast/southwest direction along the outer edge of the Sahul Shelf and comprises 11 major shoals ranging in size from 0.05km^2 to 40km^2, with an average size of 4.6km^2 (Heyward *et. al.* 1997).

The banks rise sharply above the continental slope from more than 300m to between 16m to 30m below the sea surface. The nearest, Big Bank Shoals, is located approximately 80km southwest of Cova-1 and rises to within 21m lowest astronomical tide (LAT).

The nearest emergent reefs, Ashmore, Cartier and Hibernia, are located on the southwest end of Sahul Shelf. The nearest, Hibernia reef, is more than 300km to the southwest of Cova-1. The nearest shoreline is the southern coastline of Timor-Leste, located approximately 90km to the northwest.

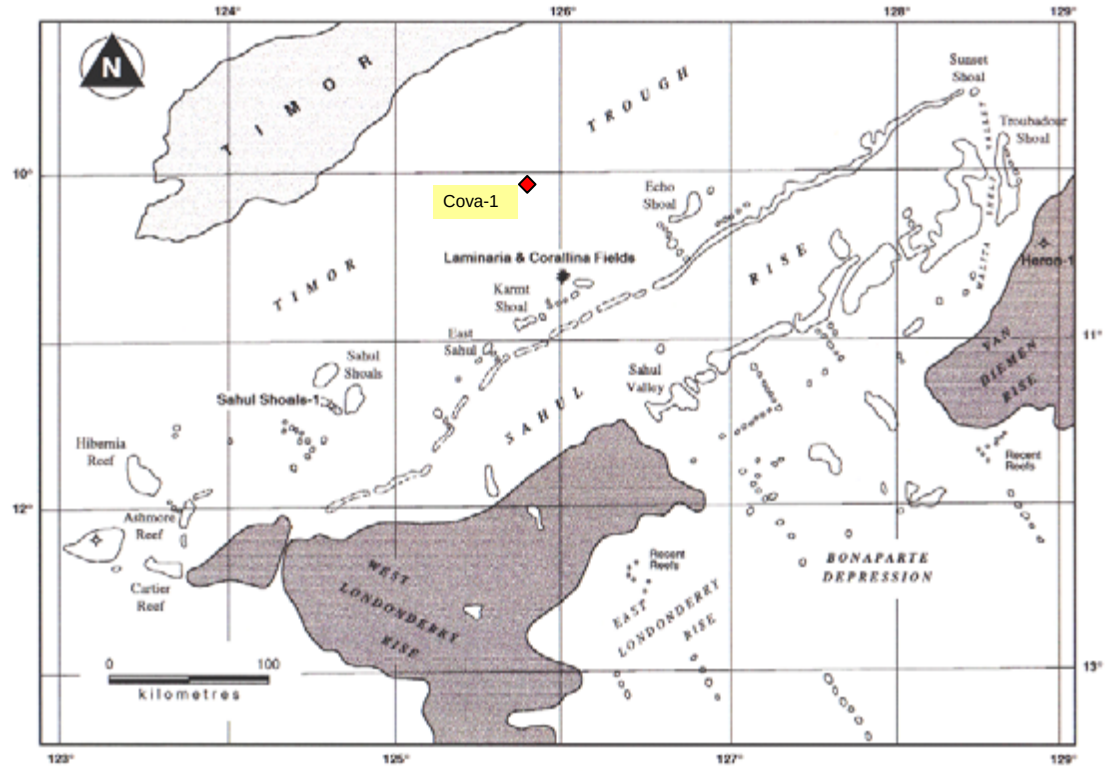

Figure 3.7: Regional bathymetry

3.1.4 Marine Sediments

Recent sampling of marine sediments in the nearby JPDA 06-105 permit area recorded fine silty sand with clay nodules throughout much of the area. Poorly sorted coarse silt to very fine sand was recorded at the majority of sampling sites. Samples from the deeper sites to the north and northwest of the permit area contained higher fines contents. Mean particle size for the survey area was 66µm (±43 SD) (Gardline 2010).

Total organic carbon (TOC) was low for the sediment type, with an average of 1.8%. Total petroleum hydrocarbons (TPH) were not recorded within the limits of detection, indicating that the marine sediments in the area are free from anthropogenic contamination. Similarly, heavy metals such as cadmium, copper and lead were well below the National Oceanic and Atmospheric Administration's (NOAA) published apparent effects thresholds (AETs), indicating no threat of toxicity to marine biota. Sediment metal concentrations in the permit area were indicative of background concentrations, and were not considered to have been affected by previous drilling activities nearby (Gardline 2010).

These marine sediment characteristics are expected to represent those in permit area S06-03, due to the relatively close proximity (<20 km) and the similar deepwater open ocean environment.

3.1.5 Seismicity and Tsunamis

The Timor Sea has been tectonically active for at least the past six million years where the Australian and Eurasian continental plates converge. Since the mid 1970s, hundreds of earthquakes have been recorded in the region. Many of the earthquakes in the Australian sector of the Timor Sea are of relatively low magnitude occurring around the edges of the Cartier and Timor Troughs.

Subduction earthquakes, caused by one edge of a crustal plate being forced below the edge of another, associated with the Timor Trough dominate the earthquakes of the area. Earthquake activity within the central Timor Trough and the island of Timor is a lot more intense, more frequent and generally of a magnitude greater than seven on the Richter scale (AUSGEO 2003).

The proposed Cova well is located in the southern part of the Timor Trough on the Australian continental plate, which is subducting to the north under Timor. The subduction zone is steeply dipping with the rate of activity along the subduction zone appearing to be greatest to the east (towards the Banda Sea) than to the west (towards Sumbawa). There appears to be an absence of seismicity to the northwest of the Cova well, although this may not be a long-term feature of the seismicity of the area.

At the Timor Trough, subduction-zone earthquakes are shallow at the offshore trench and are deepest to the north, with most subduction earthquakes occurring at depths down to approximately 200km. Few events occur between 300km and 500km depth, although some events do occur at depths exceeding 600km. Events deeper than 300km are too deep to create damage at the surface for major engineered structures.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Regional Overview

Physical, biological and environmental data for the marine and coastal environment in Timor-Leste is very scarce (Sandlund *et. al*. 2001) hence referral has to be made to isolated or more general studies. The marine fauna of the Timor Sea is part of the Indo-West Pacific biogeographical province (Figure 3.83.8). The majority of species are widely distributed in this region (Wilson & Allen 1987). Timor-Leste has been identified as part of the Wallacea region (relating mainly to the terrestrial environment) in Southeast Asia which has been identified as a biodiversity “hotspot” (CI 2007). The most ecologically important marine habitats in the Timor Sea region, in terms of biodiversity and productivity can be grouped into:

- various submerged banks or shoals on the northern Australian continental shelf and shelf slope;

- coastal intertidal coral reefs and shallow (20m to 30m) reefs; and
- mangrove and seagrass areas located along the Timor-Leste and northern Australian coast and islands (Sandlund *et. al*. 2001; SKM 2001).

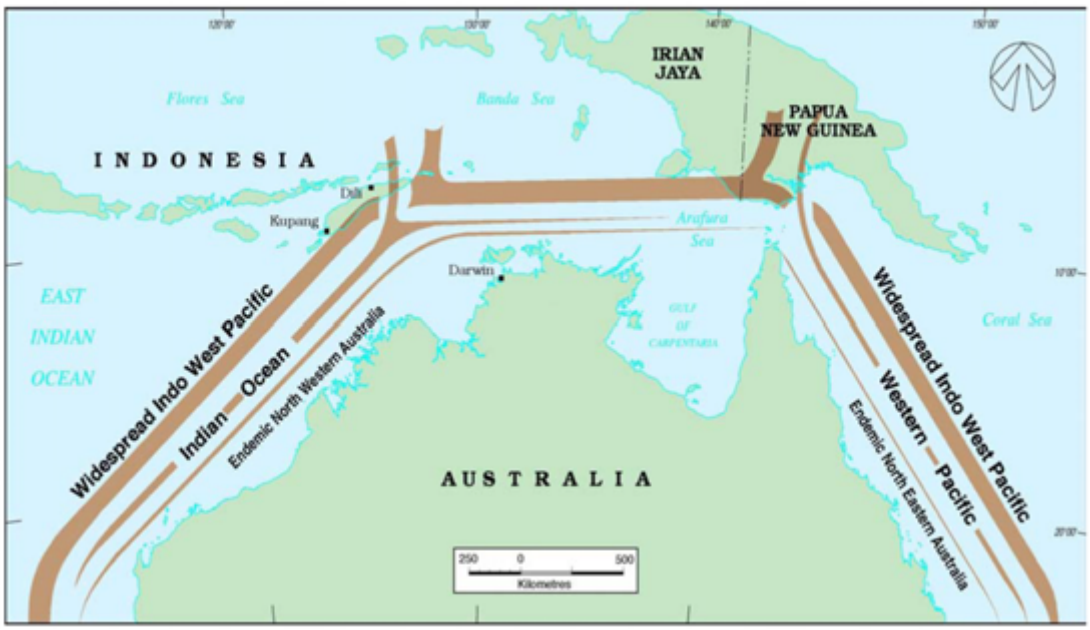

Figure 3.8 Indo-West Pacific biogeographical province

3.2.2 Bathypelagic Zone

The Cova-1 well is situated in approximately 1,900m of water in the Timor Trough. The Timor Trough, in which the drilling program is located, is classified as the bathypelagic zone (defined as between 1,000m and 4,000m deep). Sunlight does not penetrate the bathypelagic zone and bioluminescence is the only light (Ryan 2009). Despite the lack of light, the biota of the bathypelagic zone is diverse and sperm whales (*Physeter macrocephalus*) are capable of diving to the bathypelagic zone to feed on deep sea cephalopods and other megafauna.

As no plants can grow in the bathypelagic zone because of lack of light, the fauna are carnivorous, catching in their wide jaws the falling debris of the organisms which exist above them. Fish are common in the bathypelagic zone, typically feeding by ambushing prey or by attracting prey using bioluminescent lures. Due to the relatively small changes in pressure with depth, fish inhabiting the bathypelagic zone can move freely over wide depth changes without being affected by pressure changes (Ryan 2009). As such, fish species occurring in the baythypelagic zone would be expected to occur over wide depth and geographical ranges.

Benthic invertebrates inhabiting the seabed would be expected to exhibit high diversity though low abundance and productivity due to the water depth, lack of light and reliance on detrital "rain" to drive deep sea ecosystems (Ryan 2009). Infaunal assemblages would be expected to be dominated by polychaete worms and crustaceans as is typical of marine infaunal assemblages elsewhere including those of continental shelf and slope habitats of the Timor Sea.

3.2.3 Continental Shelf

Across the northern continental shelf, the predominant animals living within seabed sediments (infauna) are polychaetes (burrowing worms) and crustaceans (e.g. prawns, shrimp and crabs). These two groups comprise 84% of the total species in sediment samples with a high diversity of species but a low abundance of each individual species (Heyward *et. al.* 1997). The remaining 16% of species include echinoderms (e.g. sea stars, sea urchins, feather stars), molluscs (both gastropods and bivalves), nemerteans (ribbon worms), sponges and fish.

Epibenthic communities (animals living on the seabed) in deeper waters are generally low in fauna abundance and diversity. Heyward *et. al.* (1997) noted that with little sea floor topography and hard substrate, such areas offered minimal habitat diversity or niches for animals to occupy. The main taxa found in these areas include sponges and gorgonians (sea whips and sea fans). The absence of hard substrate is considered a limiting factor for the recruitment of epibenthic organisms (Heyward & Smith 1996).

Whilst the abundance may be low, the diversity of shelf slope invertebrates may, however, be high. A wide variety of crustaceans including scampi, prawns, carids, bugs and crabs are regularly recorded from commercial deepwater trawl catches in the North West Shelf Trawl Fishery and that the additional non commercial crustacean captures included hundreds of species (Caton & McLoughlin 1999). The continental slope of the Timor Sea can be expected to support similar crustacean diversity.

3.2.4 Sea Mounts and Shoals

The proposed Cova-1 program occurs to the north of a number of mostly unnamed sea mounts and the Sahul Shoals. On shoals in less than 50m water depth (where adequate light may penetrate), epibenthic fauna can be abundant and diverse. These areas are of ecological significance due to their regional uniqueness and their patchy distribution in an otherwise broad area of featureless seafloor.

The major shoals and banks in the region include:

- Karmt Shoals (approximately 110km to the south-southeast of the proposed Cova-1 exploration well);
- Big Bank Shoals (approximately 85km to the south-southeast of the proposed Cova-1 exploration well); and
- Echo Shoals (approximately 160km to the east-southeast of the proposed Cova-1 exploration well).

The nearest shoals to the Cova well, Big Bank Shoals were surveyed extensively by Heyward *et. al.* (1997). The Big Bank Shoals comprise thirteen banks which vary in their habitat and species composition, but are generally characterised by mixed Halimeda algae, sponge and soft coral communities with some hard corals on the more consolidated sediments. Halimeda or coral dominate ecosystems on the shallower banks and filter-feeding ecosystems dominate the deeper banks. It is not clear why some of these banks are coral-dominated while others are Halimeda-dominated. However, depth and light attenuation seem to play key roles.

South of the Sahul Shelf system lies extensive shelf flats of depths varying from 70m to about 100m. These soft sand-silty seafloors are generally flat and undulating with a sparse assemblage of species. Species present are mainly polychaetes and crustaceans, with sponges, ascidians, echinoderm, gorgonians or soft corals depending on depth and local sediment characteristics (Lavering 1993; Marsh & Marshall 1983).

3.2.5 Coral reefs

Timor-Leste is near the centre of the global region with the highest coral species diversity and there may be in excess of 500 species of coral occurring in Timor-Leste waters (Veron & Stafford-Smith 2000). A series of surveys conducted in Indonesian waters between 1990 and 1998 (Burke *et. al*. 2002) determined that the percentage of coral reefs in good or excellent condition (live coral cover of more than 50%) in eastern Indonesia were 45% compared to only 23% in western Indonesia. Burke *et. al.* (2002) also identified a number of coral reefs along the Timor-Leste coast, including five distinct communities along the south coast of Timor- Leste, that were considered to be at Medium to High risk of impact from the combined effects of coastal development, marine-based pollution, sedimentation, overfishing and destructive fishing.

Intertidal reefs and islands occur along the south coast of Timor-Leste. Wyatt (2004) surveyed a small area of the nearshore coastal marine environment on the south coast. Brittle stars (ophiuroids) and other mobile organisms as well as a total of 27 taxa of sessile organisms were identified as inhabiting the reef platform. Of the sessile organisms, 18 taxa were algae (a brown alga *Ascidium* sp. and a green alga *Caulerpa* sp.), three sponges (poriferans), two hard corals (scleractinians), two ascidians, one anemone (cnidarian) and one foraminifer.

Most of the coastline adjacent to the Cova-1 well site area is identified as “sand”, with two coral reef communities present:

- a coral reef zone extending 10km east from Betano; and
- reef immediately adjacent to the point at Suai.

Aerial observations of the south coast coral reefs, during helicopter transfers as part of Eni’s Albacora 3D survey indicate that the fringing reefs do not extend further than 100m from shore (Eni 2008).

The nearest emergent offshore coral reefs, Ashmore, Cartier and Hibernia, are located on the southwest end of Sahul Shelf. The nearest, Hibernia reef, is more than 380km to the southwest of Cova-1.

3.2.6 Nutrient availability

Water quality sampling was recently conducted in the JPDA 06-105 permit area, around 20km south of permit area S06-03, by Gardline (2010). Nutrient concentrations were assessed in surface water layers down to 20m depth. The average total nitrogen concentration was 143µgl^{-1}, which may be indicative of seasonal upwelling of nutrients from the continental slope. This phenomenon may also have contributed to the development of benthic communities on the oceanic shoals south of the permit area, discussed in Section 4.2.4 above. However, phosphorous concentrations were very low, and the nitrogen:phosphorous ratio of <16:1 is considered to indicate a "nutrient-limiting" marine environment, typical of the Timor Sea (Gardline 2010).

Chlorophyll-a concentrations were low, from below the limit of recording (0.1µgL^{-1}) to 0.3µgL^{-1}, and were consistent down to 50m depth (Gardline 2010).

3.2.7 Benthic infauna

Infauna sampling was recently conducted by Gardline throughout the JPDA 06-105 permit area. Samples of the seabed were taken using a 0.1m^2 Day grab and revealed a low abundance of infauna, indicative of sparse communities. Taxa included polychaetes, crustaceans, molluscs and echinoderms. Overall, polychaete annelids were the most common fauna recorded, which is typical of soft-bottom communities from the continental shelf to the abyssal plains (Gardline 2010).

3.2.8 Plankton

Zooplankton, which feeds on phytoplankton, provides an important food source to larger animals such as whales, fish and crustaceans. Within the region, zooplankton densities are greatest in an up-welling area between the north-west coast of Australia and Indonesia, generally during the July-August period related to the south-east monsoonal winds (Tranter 1962).

Sampling for zooplankton and phytoplankton was recently undertaken in the JPDA 06-105 permit area by Gardline (2010). Phytoplankton were sampled at 23 locations using an integrated water pump procedure at 20, 15, 10 and 5m depths. Species abundances were highly dominated by the green algae chlorophyta, which consisted mainly of the genus Prasinophyte. Overall, the majority of species identified during the survey were similar to those recorded by earlier studies in the region (Gardline 2010).

Zooplankton were sampled at 30 locations, using a 150µm mesh plankton net towed vertically from 20m depth to surface. Samples were consistently dominated by copepod crustaceans, along with urochordata and foraminifera. Overall, the highest abundances of zooplankton were observed near the Kitan-4 drilling location, which was the closest sampling area to Big Bank Shoal (1.9km away). Nutrient enriched oceanic upwelling from the Timor Trough may be influenced by the steep bank, resulting in enhanced primary production for zooplankton (Gardline 2010).

Heyward et al (1997) also conducted plankton sampling at Big Bank Shoal, and found that zooplankton biomass was in the range of 65–155 mg/m3, with diverse and abundant assemblages. Samples indicated a population of an average of 31,000 individuals representing 20 to 30 taxa, while abundance at sites away from the bank averaged approximately 17,000 individuals.

Planktonic crustaceans that feed on phytoplankton were the most prevalent taxa. A copepod (Crustacean) from the Family Paracalanidae was the most abundant zooplankton encountered. These results are consistent with those of extensive surveys conducted by Tranter (1962). The higher abundance of zooplankton in samples over the Big Bank Shoals appears to be a feature of these shoal ecosystems.

3.2.9 Marine Mammals

A number of whale and dolphin species are likely to be encountered during the drilling program, with the Timor Trench providing an important flow-through of species connecting the Pacific and Indian Oceans. Twenty-two whale and dolphin species could potentially occur in the Timor Sea near the permit area (DEWHA 2010). Of these, the Pygmy Killer Whale (*Feresa attenuata*), Killer Whale (*Orcinus orca*), False Killer Whale (*Pseudorca crassidens*), Common Dolphin (*Delphinus delphis*) and the Bottlenose Dolphin (*Tursiops truncatus*) are likely to occur.

Humpback Whales (*Megaptera novaeangliae*) are not expected to migrate as far north as the Timor Sea, although they are known to breed near the north-western Australian mainland coast during the winter months.

Marine mammal observations from Eni's Albacora 3D seismic survey by dedicated Marine Mammal Observers (MMO) provided an insight into the distribution of whales and dolphins in the Timor Sea. In September 2007, observations were made over 22 days, recording a total of 23 sightings of cetaceans comprising approximately 96 individuals (Western Whale Research 2007). These included 13 pods of Pygmy blue whales, *Balaenoptera musculus brevicauda*, and 8 pods of unidentified large whales (most likely to be Pygmy blue whales). Two pods of unidentified dolphins totalling 70 individuals were also observed. Given the large survey coverage over deep water (up to 2,500m) and short observation duration of 22 days (with excellent weather) this number of sightings is considered to be high and of very high importance to marine science.

In contrast, the MMO effort for the 3D Seismic Survey in December 2007 observed relatively low numbers of sightings in the Timor Sea (Eni 2008). Over 13 days, a total of four sightings of cetaceans comprising 16 individuals were recorded. These included one unidentified whale, one sighting of two Fraser's dolphins and two pods of unidentified dolphins. An explanation of the low numbers may be the different seasonal conditions (from Winter/Spring to Spring/Summer) and a change in surveying area from predominantly deep to shallower water (500m).

Dugongs (*Dugong dugon*) occur within Timor-Leste waters, in protected areas coinciding with sizeable seagrass beds. Given its distance offshore and water depth, dugongs are unlikely to be encountered at the Cova-1 well site.

3.2.10 Reptiles

Turtles

The tropical Indo-Pacific region supports marine turtles and sea snakes. Marine turtles include the threatened Flatback Turtle (*Natator depressus*), Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*) and Leatherback Turtle (*Dermochelys coriacea*). The Loggerhead Turtle (*Caretta caretta*) and Olive Ridley Turtle (*Lepidochelys olivacea*) also occur in the region and are listed as endangered (DEWHA 2010).

There are no turtle nesting sites or other critical habitat (e.g. breeding or feeding sites) identified within the Timor-Leste coastline adjacent to the Cova-1 well (UNEP-WCMC 2006). However, Jaco Island and Tutuala beach have been identified as turtle nesting sites (Nunes 2001) and other breeding sites may exist on the south coast of Timor-Leste where the appropriate conditions exist.

Saltwater Crocodiles

The distribution of the saltwater crocodile, *Crocodylus porosus*, encompasses Timor-Leste and the islands and coasts surrounding the Timor Sea. The animals usually inhabit territories within tidal river systems and estuaries, sometimes around coastal areas and in freshwater rivers or water bodies (Ross 1998). The saltwater crocodile is unlikely to be encountered during the drilling of the Cova-1 well.

Sea Snakes

Sea snakes are very common in subtropical and tropical waters where they occupy a wide range of habitats and water depths, extending from the coast to the reefs and banks further offshore. Sea snakes are expected in the Timor Sea region, with as many as 15 species known to occur in northern Australian waters (Storr *et. al.* 1986). Sea snakes are unlikely to be encountered during the drilling of the Cova-1 well.

3.2.11 Fish

FishBase (2006) lists 144 marine fish species in 38 families for Timor-Leste waters, with one species, the Bigeye Tuna (*Thunnus obesus*) listed as Threatened, 18 of the species as being pelagic and 10 of the species as being deep water. Many of the species listed for Timor-Leste are found throughout the tropics and are important commercial species, such as the tunas, mackerels and snappers.

Fish densities in the region of the drilling programme are likely to be low, with some pelagic species traversing the area. However waters with greater fish abundance are likely to occur in the shallow, coastal fringe and around reefs and shoals on the edge of the continental shelf (CSIRO 1999a). The broader area of the Timor Sea region supports pelagic fish species that are utilised in traditional and commercial fisheries.

The region supports large populations of cartilaginous fishes such as sharks and rays. The most prolific of the sharks are the whalers, represented by at least twelve species in the region. They are common in all environments and the oceanic white tipped sharks (*Carcharhinus longimanus*) occur in the deeper offshore areas. Whale sharks may occur occasionally in the permit area, although little is known of their movements through the region.

3.2.12 Birds

Timor-Leste has approximately 224 species of birds of which 23 are endemic to the Timor island group (World Bank 2005). Of the known species that occur in Timor-Leste, two are listed as critically endangered and three are listed as endangered under the IUCN Red List. Of these birds, only the Christmas Island Frigatebird, *Fregata andrews* is a seabird.

Birdlife at the Cova well location is expected to be limited given the oceanic environment. A large variety of seabird species are expected to migrate across the region or forage within the coastal waters of the Timor Sea. Shoreline species may pass through these areas during migrations or enter for short periods during foraging. Seabirds that may occur in the Cova-1 well area includes various tern species, the silver gull (*Larus novaehollandiae*), the lesser frigate bird (*Fregata areii*), the common noddy (*Anous stolidus*) and the migratory seabird, the streaked shearwater (*Calonectris leucomelas*).

In a systematic survey of seabird distribution in the eastern Indian Ocean carried out in 1995 (Dunlop *et. al.* 1995) it was found that seabird distributions were generally very patchy except near islands where shelter and anomalies in surface water concentrated food seasonally. For example, Ashmore Reef (located over 380km to the southwest of Cova-1) is a significant staging point for wading birds migrating between Australia and the northern hemisphere, including forty-three species listed on one or both of CAMBA and JAMBA.

Ashmore Reef supports extremely high concentrations of breeding seabirds, many of which are nomadic and typically breed on small isolated islands. CSIRO (1999b) recorded over 10,000 seabirds of nine species on Ashmore Reef and at sea within the Timor MOU74 (Memorandum of Understanding) Box during a survey between September and October, 1998. These species are listed in Table 3.53.5.

Table 3.5 Seabirds species on Ashmore Reef and at sea within the Timor MOU74 Box during a survey between September and October, 1998

Common name	Scientific name
Crested Tern	*Sterna bergii*
Sooty Tern	*Sterna fuscata*
Roseate Tern	*Sterna dougalli*
Common Noddy	*Anous stolidus*
Brown Booby	*Sula leucogaster*
Masked Booby	*Sula dactylatra*
Bulwer's Petrel	*Bulweria bulwerii*
Matsudaira's Storm-Petrel	*Oceanodroma matsudairae*
Leach's Storm-Petrel	*Oceanodroma leucorhoa*

Source: CSIRO 1999b

3.2.13 Mangroves

Mangroves occupy approximately 7,500 acres along the coastline of Timor-Leste. On the south coast, they tend to form small communities at the mouths of streams and in marshy or swampy terrain (timorNET, 2007).

The mangroves species that occur along the coast of Timor-Leste include, *Bruguiera parvifolia*, *Sonneratia alba*, *Rhizophora conjugata*, *Excoecaria agallocha*, *Avicennia marina*, *Aegiceras corniculatum*, *Acanthus ilicifolius*, *Lumnitzera racemosa*, *Heritiera litoralis*, *Acanthus ilicifolius*, *Achrosticum aureum*, *Xylocarpus granatum*, *Corypha utan*, *Pandanus odoratissimus*, *Cycas circinalis*, *Dolichandrone spathacea* and *Melaleuca leucadendron* (timorNET, 2007).

3.2.14 Conservation Significant Biological Resources

There are currently no legislative instruments, such as national laws or ratification of international conventions and treaties, in place in Timor Leste to protect threatened species of flora and fauna. However, a number of animals that are protected under international agreements could occur within the marine environment around the Cova prospect area (DEWHA 2010[1]). These include seven whales, four dolphins, four turtles, one fish and one bird species (Table 4.6).

[1] This reference source is the Australian Government threatened species database, maintained under the *Environment Protection and Biodiversity Conservation Act* 1999. Areas covered by the database include the Timor Sea. The database provides an indication of the likely distribution of a number of threatened species that are listed under Australian law and international conventions, but is coarse in scale and has not been ground-truthed for permit area S06-03, where Cova-1 is located.

All these animals are widely distributed oceanic species. There are no particular seabed, oceanographic or topographic features in or near permit area S06-03 that could offer special breeding or feeding habitat for these species, although it is noted that the Timor Trough may be used by whales as a migratory path.

Table 3.6: Protected marine species that may occur near Cova

Common name	Scientific name	Distribution	Conservation status*
Mammals			
Blue whale	*Balaenoptera musculus*	Open ocean, world-wide distribution. Considered to be endangered. Occasional visitor to region.	Migratory (CMS Appendix 1) CITES Appendix 1 Endangered (IUCN)
Humpback whale	*Megaptera novaeangliae*	Considered to be endangered. Known migration path not near proposed development site.	Migratory (CMS Appendix 1) CITES Appendix I
Antarctic minke whale, dark-shoulder minke whale	*Balaenoptera bonaerensis*	Throughout the Southern Hemisphere. Recorded in all Australian states except Northern Territory.	CITES Appendix 1 Migratory (CMS Appendix 2)
Bryde's whale	*Balaenoptera edeni*	Temperate to tropical waters, both oceanic and inshore.	Migratory (CMS Appendix 2) CITES Appendix I
Killer whale	*Orcinus orca*	Global and circum-Australia.	Migratory (CMS Appendix 2)
Sperm whale	*Physeter macrocephalus*	Global in deep waters in all oceans and confluent seas. Circum-Australia.	Migratory (CMS Appendix 2) CITES Appendix I Vulnerable (IUCN)
Spotted bottlenose dolphin	*Tursiops aduncus*	Tropical and sub-tropical coastal and shallow offshore waters of the Indian Ocean, Indo-Pacific Region and the western Pacific Ocean. Circum-Australia.	Migratory (CMS Appendix 2)
Minke whale	*Balaenoptera acutorostrata*	Tropical and warm-temperate waters of the Southern Hemisphere. Western, southern and eastern Australian waters.	CITES Appendix I
Spinner dolphin	*Stenella longirostris*	Pelagic zone of tropical, subtropical and, less frequently, in warm temperate waters in the Indian, Pacific and Atlantic Oceans. South-western Australia northwards to south-eastern Australia.	Migratory (CMS Appendix 2)
Striped dolphin	*Stenella coeruleoalba*	Temperate to tropical species. South-western Australia northwards to south-eastern Australia.	Migratory (CMS Appendix 2)
Spotted dolphin	*Stenella attenuata*	Pantropical oceanic tropical zones between about 40° N and 40° S. South-western Australia northwards to south-eastern Australia.	Migratory (CMS Appendix 2)

Common name	Scientific name	Distribution	Conservation status*
Reptiles			
Loggerhead turtle	*Caretta caretta*	Global distribution in tropical, subtropical and temperate waters.	Migratory (CMS Appendix 1)
Leatherback turtle	*Dermochelys coriacea*	Global tropical and temperate distribution, largest populations in Atlantic, Pacific and Indian Oceans and Caribbean Sea.	Migratory (CMS Appendix 1) CITES Appendix I Critically endangered (IUCN)
Green turtle	*Chelonia mydas*	Global distribution including tropical waters of Northern Australia.	Migratory (CMS Appendix 1) CITES Appendix I Endangered (IUCN)
Hawksbill turtle	*Eretmochelys imbricata*	Global distribution in tropical, subtropical and temperate waters, largest populations occur in Australian waters.	Migratory (CMS Appendix 1) Critically endangered (IUCN)
Fish			
Whale sharks	*Rhincodon typus*	Broad distribution between latitudes 30° N and 35° S in tropical and warm temperate seas, both oceanic and coastal settings. Circum-Australia but most common in waters off northern Western Australia, Northern Territory and Queensland.	Migratory (CMS Appendix 2) Vulnerable (IUCN)
Birds			
Streaked shearwater	*Calonectris leucomelas*	Northern Territory and eastern coastline of Australia.	Migratory (JAMBA, CAMBA)

Definitions of threatened species status under international agreements

Convention on International Trade in Endangered Species (CITES):
Appendix 1 Species threatened with extinction

Convention on Migratory Species (CMS):
Appendix 1 Migratory species that have been categorized as being in danger of extinction throughout all or a significant proportion of their range
Appendix 2 Migratory species that have an unfavourable conservation status or would benefit significantly from international co-operation organised by tailored agreements

International Union for the Conservation of Nature (IUCN) Red list:
Critically endangered Considered to be facing an extremely high risk of extinction in the wild
Endangered Considered to be facing a very high risk of extinction in the wild
Vulnerable Considered to be facing a high risk of extinction in the wild

China-Australia Migratory Bird Agreement (CAMBA):
Species listed under the agreement are considered migratory and in danger of extinction

Japan-Australia Migratory Bird Agreement (JAMBA):
Species listed under the agreement are considered migratory and in danger of extinction

3.2.15 Conservation Areas

The nearest currently declared marine conservation zones or marine protected areas to Cova-1 well are: Jaco Island Marine Park, at the eastern end of Timor-Leste (approximately 130km northeast); the Australian Ashmore Reef National Nature Reserve (approximately 380km south-west); and the Indonesian Teluk Kupang/Pulau Kera Marine Recreation Park (approximately 220km west) (SKM 2001). All are considered to be too far away to be impacted by the drilling activities.

The coastal waters surrounding Timor-Leste are considered to be included in the Coral Triangle which is a geographical term referring to the tropical marine waters of Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands and Timor-Leste that according to the World Wildlife Fund harbours 75% of all known coral species, more than half of the world's reefs, 40% of the world's coral reef fish species, and six of the world's seven species of marine turtle.

3.3 SOCIAL ENVIRONMENT

3.3.1 Socio-economic Profile

An assessment of the socio-economic conditions in Timor-Leste was compiled by Environmental Resources Management Australia Pty Ltd (ERM) in 2009, from a range of existing data sources (ERM 2010). A brief summary of some key socio-economic indicators from this study is provided in Table 4.7.

Table 3.7: Snapshot of socio-economic indicators in Timor-Leste

Indicator	Value	Date	Source
Demographics			
Total population	1,131,612	2010	CIA World Factbook
Annual population growth rate	2%	2009	CIA World Factbook
Aged under 15	35%	2009	Direcção Nacional de Estatística
Median age (years)	21	2009	Direcção Nacional de Estatística
Population density	22 persons/km^2	2008	World Bank
Religion (% of population)	Predominantly Roman Catholic, with Muslim and Protestant Christian minorities	2008	UNDP
Official languages	Tetun and Portuguese (official); English and Bahasa Indonesia (working languages)	2008	UNDP
Economy			
Nominal GDP per capita (current US$)	$470 USD	2008	IMF

Indicator	Value	Date	Source
GDP on a purchasing power parity basis	$2,400 USD	2009	IMF
Non-oil real GDP growth rate (%)	Agriculture: 32.2%, Industry: 12.8%, Services: 55%	2010	CIA World Factbook
Human Development Index (HDI) ranking	162nd out of 182	2009	UNDP
% population that lives below the national poverty line ($15.44 per capita income per month)	42%	2003	CIA World Factbook
Employment and Livelihoods			
Major employers	Subsistence farming and fishing, government and wholesale and retail trade industries	2007	Timor Leste Living standards Survey
Unemployment rate (rural)	20%	2006	CIA World Factbook
Infrastructure			
Coverage of national water supply	58%	2006	UNDP
% households that obtain drinking water from a protected source	National 76.3%, Rural east 22.3%, Rural central 55.7%, Rural west 60.6%	2006	UNDP
% road network in poor or very poor condition	92 [22% is very poor; 70% is poor]	2005	ADB

3.3.2 Infrastructure

The capital, Dili, on the north coast of Timor-Leste, is serviced by a harbour capable of taking medium sized cargo ships. The airport at Dili is capable of taking medium to large passenger and cargo aircraft (e.g. Boeing 737). The only other airstrip capable of taking similar sized aircraft is that near the town of Baucau, some 100km to the east of Dili. Baucau airport is capable of taking large passenger and cargo aircraft and has been used for military purposes.

3.3.3 Communities near the Permit Area

The Cova prospect lies offshore from the southern coastal districts of Cova Lima (population 53,000), Ainaro (52,500) and Manufahi (45,000). Within these districts, there are seven sub-districts and around seventeen sucos along the coast.

Small towns and villages are spread throughout these sucos, usually located a few kilometres inland from the coast. The two largest population centres on the coast adjacent to the drilling area are Suai (population 23,000), capital of Cova Lima district, and Betano, a coastal village in Manufahi.

3.3.4 Petroleum Activities

Several offshore petroleum production facilities are located within a 200km radius of the permit area:

- the Northern Endeavour FPSO, producing export oil from the Laminaria-Coralina condensate field;
- the Jabiru Venture FPSO, producing export oil; and
- the Challis Venture FPSO, producing export oil.

In addition, Eni's proposed Kitan Development is located approximately 80km south-southeast of Cova. The Kitan Development is expected to commence production in 2011.

3.3.5 Shipping

The major commercial shipping routes through the Timor Sea pass well to the north and south of the permit areas. Vessels utilising these routes include bauxite carriers servicing terminals at Gove (Northern Territory) and Weipa (Cape York Peninsula), and coal carriers and container vessels departing Queensland ports for destinations in the Middle East, Europe and South Africa (LeProvost Dames & Moore 1997).

Vessel movements routinely operating in waters of the JPDA to the south of Contract Area C include those servicing the Challis/Jabiru, Corallina/Laminaria oilfields and Bayu Undan gas field.

3.3.6 Fisheries

Commercial Fishing

The Government of Timor-Leste issued four commercial fishing licences for the Timor Sea in 2006. These were operated in 2007, but the Direcção Nacional de Pescas e Aquiculture (DNPA) (National Directorate of Fisheries & Aquaculture) have advised that these were not operated in 2008. Illegal fishing is also known to occur in the waters south of Timor-Leste.

Traditional and Subsistence Fisheries

Coastal communities along the 600km of Timor-Leste's coastline rely on a wide range of fish, including the large tunas, flying fish, coral reef fish and deepwater snappers for their livelihoods. The DNPA estimates that for over half the 20,000 fishermen of Timor-Leste, fishing is the main source of food and income. United Nations (UN) support since 1999 has helped re-establish the nation's fishing capacity, with the fish catch estimated to be 1,600 tonne in 2002 (Jasarevic, 2002).

The main vessel for traditional fishing is the pirogue, a small, flat-bottomed boat often propelled by paddles, although outboard motors are becoming increasingly common. Traditional fishing uses both gill net and handlines, and fishing activities usually do not extend more than 2 nautical miles (<4km) from the coast.

Recreational Fishing

The drilling program is located in a very remote area and the deep waters are unlikely to be of interest to recreational fishing. Apart from the possibility of occasional passing private motor vessels or yachts, there are no known tourism interests in the area

3.3.7 Shipwrecks and Heritage Sites

There are no known significant marine heritage or archaeological sites in the vicinity of the proposed Cova-1 well.

4. ENVIRONMENTAL RISK ASSESSMENT

4.1 INTRODUCTION

This chapter describes the potential environmental impacts associated with the drilling of the Cova-1 exploration well. Section 4.2 describes Eni's risk assessment methodology. Sections 4.3 and 4.4 presents risk registers for routine activities and non-routine incidents respectively.

4.2 ENVIRONMENTAL RISK ASSESSMENT METHODOLOGY

Eni's philosophy to managing environmental risks is to remove or mitigate the risk during the design phase. Managing risks through design is contingent upon identifying, at an early stage in the project, the sources and pathways by which environmental impacts can occur and the sensitivities of the receiving environment in which the project is situated.

Eni's risk assessment procedure was implemented in order to assess the expected or potential impacts associated with the drilling of Cova-1. Eni's risk assessment methodology provides a systematic process for:

1. identifying each project activity and its associated environmental aspects;
2. identifying the environmental values/attributes at risk within and adjacent to the area;
3. defining the potential environmental effects of aspects identified in Step 1 on those values/attributes at risk identified in Step 2 above;
4. identifying the likelihood of occurrence;
5. identifying the consequences of potential environmental aspects; and
6. evaluating overall environmental risk levels using a likelihood and consequence matrix.

Figure 4.14.1 provides a generic representation of Eni's risk assessment methodology. Table 4.14.1 presents Eni's risk matrix showing likelihood, consequence and risk ranking classifications and Table 4.24.2 presents the environmental consequence descriptors.

A high-level risk assessment workshop was conducted in March 2010 based Eni's knowledge and understanding of risks and impacts gained through its previous drilling in the Timor Sea. The outcomes of the risk assessment are presented in Section 4.3 (Table 4.3) for routine activities and associated emissions and discharges, and in Section 4.4 (Table 4.4) for non-routine incidents such as oil and chemical spills.

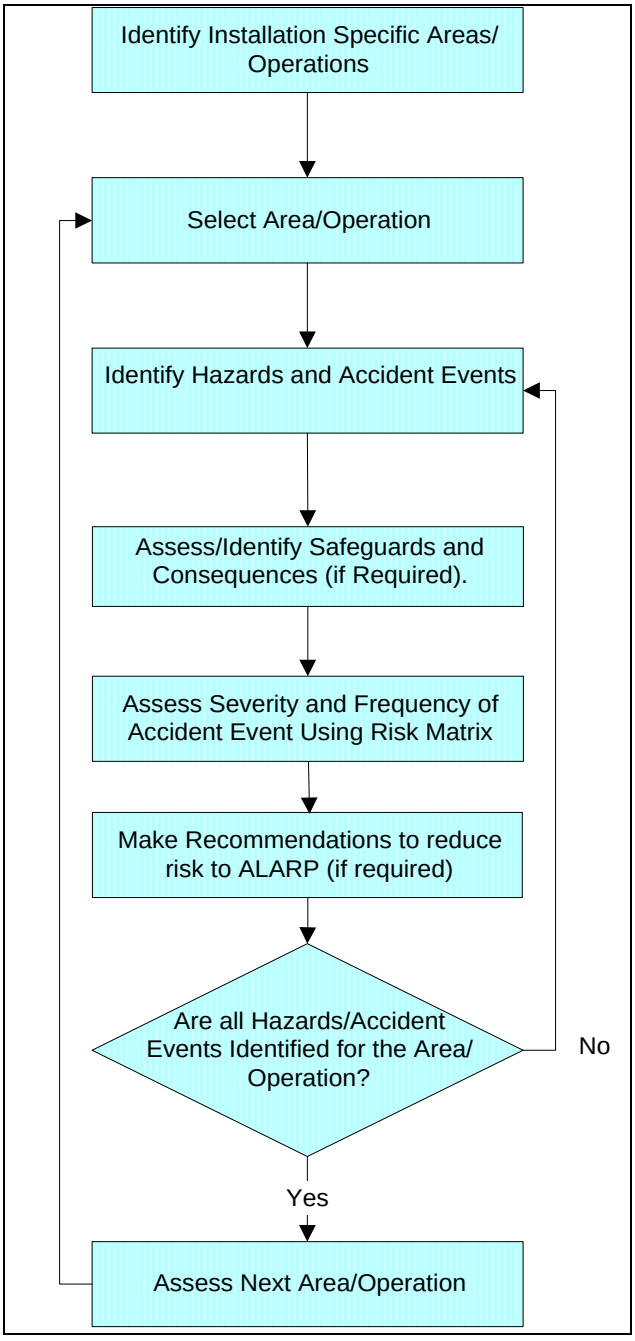

Figure 4.1: Risk Assessment Methodology

Table 4.1: Eni Risk Matrix

Consequence								*Increasing Annual Frequency/Likelihood*					
Severity	Reputation		Labour	Community	Health & Safety		Environment	Assets/Activities	0	A	B	C	D	E
	Stakeholder Relation	Company Image			Health	Safety			Practically non-credible occurrence	Rare occurrence	Unlikely occurrence	Credible occurrence	Probable occurrence	Likely/Frequent occurrence
									Could happen in E&P industry	Reported for E&P industry	Has occurred at least once in Company	Has occurred several times in Company	Happens several times/year in Company	Happens several times/year in one location
1	Slight impact	Slight impact	Slight impact	Slight impact	Slight impact	Slight impact	Slight impact	Slight impact	LOW					
2	Minor impact	Minor impact	Minor impact	Minor impact	Minor impact	Minor impact	Minor impact	Minor impact				MEDIUM		
3	Significant impact	Local impact	Medium impact	Local impact	Significant impact	Significant impact	Local impact	Local impact						
4	Major impact	National impact	Major impact	Major impact	Major impact	Major impact	Major impact	Major impact					HIGH	
5	Extensive impact	International impact	Extensive impact	Extensive impact	Extensive impact	Extensive impact	Extensive impact	Extensive impact						

Table 4.2: Environmental Consequence Descriptors

Descriptor	Description
Slight Impact	Small discharges with confined and temporary impact on the area. No noticeable impact on water/air/soil and biodiversity. Negligible impact due to GHG emissions. Good materials/energy/water selection and use. Negligible financial consequences.
Minor Impact	Sufficiently large discharges to impact the environment but no long lasting effect. Short-term, localised impact on water/air/soil and biodiversity (on a limited no. of non-threatened species). <1 week for clean up, 1-2 years for natural recovery. Slight impact due to GHG emissions. Adequate materials/energy/water selection and use. Single breach of statutory or prescribed limit or single complaint.
Local Impact	Limited discharges affecting the neighbourhood and damaging the environment with longer effects. Short term, more widespread impact on water/air/soil and biodiversity (on a higher no. of non-threatened species). <1month for clean up, 2-5 years for natural recovery. Limited impact due to GHG emissions. Inadequate materials/energy/water selection and use. Repeated breaches of statutory or prescribed limit or many complaints.
Major Impact	Large discharges with severe and long lasting environmental damage. Medium-term, widespread impact on water/air/soil and biodiversity (on some threatened species and/or ecosystem function). 1-5 months for clean up, 5-10 years for natural recovery. Extensive measures (financially significant) required to restore the impacted area. Significant impact due to GHG emissions. Poor materials/energy/water selection and use. Extended breaches of statutory or prescribed limits, or widespread nuisance.
Extensive Impact	Large discharges with severe and persistent environmental damage. Long-term, large-scale impact on water/air/soil and biodiversity (likely permanent species loss and impact on ecosystem function). >5 months for clean up, >10 years for natural recovery. Very poor materials/energy/water selection and use. Major financial consequences for the Company. Ongoing breaches well above statutory or prescribed limits.

4.3 COVA-1 RISK REGISTER – ROUTINE ACTIVITIES

Table 4.3: Cova-1 Drilling: Potential Environmental and Social Risks and their Safeguards

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Physical Disturbances to Marine Fauna										
Noise/ vibration caused by drilling	Disturbance to cetaceans, turtles, seabirds and fish	• The Cova-1 well is not in a known feeding, breeding or aggregation areas for marine fauna. • Expected noise levels are below the level of noise that may cause interference to cetaceans of 150db (McCauley, 1998). • The dominant frequencies of drilling are below the hearing range of turtles (100Hz–700Hz). • An 'alarm' response is displayed by turtles approximately 2km from a seismic survey source (McCauley *et al*, 2000). The noise intensity of drilling is far less, so the range of disturbance would be decreased. • Cetaceans may demonstrate avoidance behaviour from 2km–8km away. • Drilling noise frequencies and intensities (McCauley, 1998) are not in the most sensitive range for cetaceans or turtles. • The relatively constant noise source of drilling is less likely to traumatise fauna than erratic sources.	B	2	Low	• Cetacean interaction standards followed. • Induction of all personnel to include the requirement to report cetacean sightings. • Ensure that crew are aware about the possibility of disturbing marine fauna and that drilling start-up procedures are followed. • Observations for marine mammals prior to wireline seismic activity and implementation of soft-start procedures.	B	2	Low	5.7

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Noise caused by support and supply vessels	Disturbance to cetaceans, turtles and fish	• The proposed Cova-1 well is not in a known feeding, breeding or aggregation areas for marine fauna. • Noise levels are loudest when the supply vessels are positioning the rig. This is of a short duration relative to drilling. • Supply vessels are under low propulsion power when in close proximity to the rig.	B	2	Low	• Nil identified	B	2	Low	5.7
Noise caused by support aircraft	Disturbance to roosting seabirds and marine fauna	• Estimated to be three or four flights to the drillship from Dili per week.	B	2	Low	• Compliance with Australian National Guidelines for Whales & Dolphins Watching 2005 as it refers helicopters, i.e.: - no flying lower than 500m within a 500m radius of a whale or dolphin; - no hovering over the no-fly zone; - avoiding approaching a whale or dolphin from head-on; - avoiding flying directly over, or passing the shadow of the helicopter directly over a whale or dolphin; and - cease the activity if the whale or dolphin shows signs of disturbance.	A	2	Low	5.7

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Light from rig	Disturbance to turtles and seabirds	• The proposed Cova-1 well is not in a known feeding, breeding or aggregation areas for marine fauna. • Lighting may result in a short term abundance of certain species attracted by the light. Drilling will last in the order of 30 to 35 days and this period of time will not cause irreversible fauna behaviour.	B	2	Low	• Preferential use of fluorescent lights that meet required safety standards.	B	2	Low	5.7
Hull fouling	Introduction of marine pests to Timor Leste or Australian waters	• Drillship will transit from international waters direct to Cova-1 well site. Water depth is 2000m therefore not conducive to supporting non-indigenous marine species (NIMS). • Supply/support vessels will transit from Australian waters to Cova-1 well site. Only possible introduction of NIMS is into Australian waters. • Supply/support vessels on site and in contact with drillship for less than 24hrs so opportunity for translocation of NIMS to supply/support vessels is minimal.	A	3	Low	• Eni shall vet each vessel prior to its mobilisation from international waters including conducting a risk assessment to determine the risk the vessel poses in introducing NIMS from biofouling. • Each vessel should have Antifouling Certification or maintain a Biofouling Record Book detailing the management actions implemented to minimise the risk of introducing or spreading NIMS via biofouling.	A	3	Low	5.5

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Waste Discharges										
Drilling fluids	Disturbance to marine environment Adverse effects on water quality	• Drilling fluid adheres to drill cuttings and is consequently disposed of overboard with the cuttings. • High dilution rates – dilutions of >1:100 within 20m of the discharge are predicted during all sea conditions (Swan *et al*, 1994). • Open oceanic environment remote from sensitive marine resources. • Low toxicity water based muds (WBMs) will be used as drilling fluids.	E	1	Low	• Drilling fluids are reviewed and selected based on technical suitability and by having a minimum overall effect on environment (including ecotoxicity and dosing requirement characteristics). • Use of drilling chemicals will be minimised as far as is practicable. • Drill floor drainage system catches any spills and reports to oil in water separator. • The amount of drilling fluids disposed of with cuttings will be ≤15% of the total volume of WBMs used in the program. • Drilling fluid discharge will be minimised by cuttings shakers equipment aboard the rig.	E	1	Low	5.2
Drill Cuttings	Increased turbidity in the water column Disturbance to benthic marine fauna	• Turbidity in the water column during drilling is caused by the fine cuttings and drilling muds remaining suspended in the water. • The proposed Cova-1 well is not in a known feeding, breeding or aggregation areas for marine fauna.	E	1	Low	• Drilling riser-less decreases turbid plume as the cuttings are discharged at the seabed and therefore there is little opportunity for dispersal.	E	1	Low	5.2

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Drill Cuttings	Smothering of benthic organisms	• Modelling (Sustainability 2010) has shown that the majority of cuttings would settle on the seabed within 700m of the well at a low average concentration of 0.24kg/m^2 – 1kg/m^2 and an average thickness of <1mm. • There are no sensitive benthic habitats in the immediate vicinity of the proposed Cova-1 well.	E	1	Low	• Undertake a post-drilling ROV survey to confirm the fate of riser-less drill cuttings on the seabed.	E	1	Low	5.7
Deck drainage	Disturbance to marine environment Adverse effects on water quality	• Low concentration of contaminants when combined with wash down water. • Low volumes of overboard discharges involved. • Deck areas occasionally washed down with biodegradable industrial detergent such as 'Rigwash' to avoid build up of oily contaminants.	E	1	Low	• Drainage system on drill floor reports to slops tank. • Absorbents and containers will be available on the rig to clean up small accumulations of oil and grease around work areas and deck s. • Process bunding has many times the capacity of the chemical tank volume with the facility to overflow to a main skid bund. • Oily water from drillship machinery space bilges captured and directed to a sludge tank, which in turn drains into a slops tank before transport to the mainland for disposal at approved facilities.	D	1	Low	5.2
Laboratory wastes	Disturbance to marine environment Adverse effects on water quality	• Laboratory wastes generated during oil testing.	B	2	Low	• Oil soluble chemicals will be disposed to the drillship oil storage holds prior to transport to the mainland for disposal. • Laboratory chemical volumes minimal and consequently disposed directly overboard.	A	2	Low	5.2

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Cooling water	Disturbance to marine environment Adverse effects on water quality	• Approximately 800L/minute. • The cooling water system is a segregated system, therefore not in contact with hydrocarbons nor are chemicals added to the water. • High dilution rates due to the open ocean conditions would mean that no change in salinity would be detectable outside a localised area.	E	1	Low	• The cooling water discharge point is above sea level allowing for cooling and oxygenation as it falls.	E	1	Low	5.2
Reject (brine) water	Disturbance to marine environment Adverse effects on water quality	• Approximately 30m^3 per day of water produced from reverse osmosis. • Small volumes discharged and high dilution rates due to the open ocean conditions would mean that no change in salinity would be detectable outside a localised area.	E	1	Low	• Nil identified.	E	1	Low	5.2
Cement	Disposal of excess cement Smothering of benthic organisms	• A maximum of 60m^3 of cement will be present on the seabed.	E	1	Low	• Minimise the volume discharged. • Cement and associated chemicals are reviewed and selected based on technical suitability and by having a minimum overall effect on environment.	E	1	Low	5.2

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Waste oil and chemicals	Disturbance to marine environment Adverse effects on water quality	• Waste oil and chemicals will be stored onboard the drillship and transferred to the mainland for disposal.	B	1	Low	• Wastes stored onboard in appropriate containers. • Handling of all hazardous wastes must be conducted in line drillship procedures. • All hazardous waste material will be disposed of appropriately onshore. • Hazardous wastes will be labelled and transferred, in accordance with Material Safety Data Sheet (MSDS) instructions. • Induction of all personnel includes information on waste management procedures.	A	1	Low	5.3
Sewage, grey water and putrescibles wastes	Disturbance to marine resources, adverse effects on water quality Nutrient enrichment and biostimulation of the water column surrounding the drillship	• Maximum 173 people onboard. • The estimated volume of sewage water produced is 60L/person/day. The small volumes of sewage water discharged ensure that only a localised area would be affected by the waste discharge. • The estimated volume of grey water produced is 140L/person/day. The small volumes of grey water discharged ensure that only a localised area would be affected by domestic waste discharge. • The grey water is comprised of potable water, soap and detergents so none of the identified components of grey water are inherently toxic.	E	1	Low	• All sewage to be treated and discharged in accordance with MARPOL Annex IV (Regulation 11). • All food scraps and putrescible wastes to be comminuted to <25mm and discharged in accordance with MARPOL Annex V (Regulation 3).	E	1	Low	5.2

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
		• There are no sensitive habitats in the immediate vicinity of any of the Cova-1 well.								
Ballast Water	Displacement of endemic species with introduced pests	• The Cova-1 well is located in an open ocean and the environment does not provide a habitat for ballast water organisms to colonise.	B	1	Low	• Ballast water from a foreign port will not be discharged into Timor Leste or Australian waters less than 200m deep.	A	1	Low	5.5
Disposal of BOP fluids	Disturbance to marine resources, adverse effects on water quality	• Type of fluid: Erifon HD 603 (McDermid) • Estimated 18 L/day discharged to sea during function tests.	E	2	Low	• BOP fluids are reviewed and selected based on technical suitability and by having a minimum overall effect on environment.	E	2	Low	5.2
Solid and Hazardous Waste										
General rubbish	Disturbance to marine resources, adverse effects on water quality	• Domestic and industrial solid wastes collected and segregated on the drillship.	B	1	Low	• All waste material will be returned to the Australian mainland for appropriate onshore disposal. • Induction of all personnel. • Good housekeeping practices, including segregation of wastes. • Tracking of waste i.e. monitoring of volumes and types.	B	1	Low	5.7
Hazardous wastes	Disturbance to marine resources, adverse effects on water quality	• Hazardous solid and liquid wastes, collected and segregated on the drillship.	B	1	Low	• Wastes stored onboard in appropriate containers. • Hazardous wastes will be labelled and transferred to the mainland, in accordance with the MSDS instructions. • Tracking of waste, i.e. monitoring of volumes and types.	B	1	Low	5.7

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Atmospheric Emissions										
Power generation	Localised effect on air quality Global contribution to greenhouse gases	• Drillship uses approximately 30m^3 per day of diesel. • The supply/support vessel uses approximately 10m^3 per day.	E	1	Low	• Vessel surveyed and issued with International Air Pollution Prevention Certificate • Drillship planned maintenance program in place. • Equipment will be maintained to manufacturer's specifications. • Engine output is adjusted to maintain station under prevailing environmental conditions. • Selection of low sulphur diesel in line with MARPOL requirements to minimise SOx emissions.	E	1	Low	5.4
Flared hydrocarbons	Localised effect on air quality Global contribution to greenhouse gases	• No intention to flare hydrocarbons during normal drilling (no well-testing proposed). • Small volumes of hydrocarbons may be flared to release pressure if encountered unexpectedly (emergency flaring).	E	1	Low	• The volume of gas flared (if encountered during drilling) will be minimised by Eni's well control measures • No well testing	E	1	Low	5.4

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Ozone depleting substances (ODS)	Localised effect on air quality	• The following ODSs used in AC systems and freeze rooms - HFC R407c, HFC 134a and HCFC R22. These are closed systems and do not vent to atmosphere. For maintenance a vacuum pump used to recover the gas into the circuit. • ODS (halon) will also be present on helicopters. In the event of an emergency a small volume of halon would be released.	C	1	Low	• An ODS inventory shall be maintained and reviewed to ensure compliance with MARPOL Annex VI (Regulation 12) • There will be no discharge of ODS except in the case of a helicopter emergency. • Any release of ODS will be reported as an environmental incident and investigated.	C	1	Low	5.4
Physical Presence leading to Social Disturbances										
Interference with commercial/ traditional fishing	Disruption to fishing vessels	• No commercial fisheries or traditional fishing activities occur in the vicinity of Cova-1.	A	2	Low	• A temporary exclusion zone will apply around the drillship. • Navigation lighting and permanent watch aboard the rig and support vessels. • Watch is kept at all times.	A	1	Low	N/A
Interference with shipping	Disruption to shipping routes	• No major shipping lanes in vicinity of Cova-1.	B	2	Low	• Notification to DNMA, ANP and AMSA and establishment of 500m exclusion zone around drillship. • Navigation lighting and permanent watch aboard the rig and support vessels.	B	2	Low	N/A
Interference with recreational vessels	Disruption to recreational users	• No recreational vessels utilise this area.	A	1	Low	• Nil required.	A	1	Low	N/A

Source of Risk	Potential Environmental Effects/ Incidents	Description	Inherent Risk			Controls in Place	Residual Risk			Management Strategy
			Freq.	Conse-quence	Risk		Freq.	Conse-quence	Risk	
Interference with culturally or historically significant sites	Disruption to significant sites	• No known or suspected culturally or historically significant sites occur in this area.	A	1	Low	• Nil required.	A	1	Low	N/A
Interference with amenity, National Parks or Conservation Reserves	Disruption to conservation values of National Parks or Conservation Reserves	• No national parks ,Ramsar listed areas, conservation reserves or marine protected areas occur near the Cova-1 well.	A	1	Low	• Nil required.	A	1	Low	N/A

Table 4.4: Cova-1 Risk Register – Oil, fuel and chemical spills: potential environmental risks and their safeguards

Release Event	Cause	Maximum Spill Size (m^3)	Safeguards	Likelihood	Consequence	Residual Risk	Management Strategy
Loss of well control and blow-out	Well integrity failure Errant vessel collision Well head damage in severe weather	100,000	• Develop a bridging document for well control procedures to clarify Eni and Saipem responsibilities, with respect to: - testing the BOP prior to commencement of operations and regularly during operations; - pressure testing casing strings; - continuously monitoring for abnormal pressure parameters during drilling; - ensuring the drill crew is fully trained in emergency well control and OSCP procedures; • BOP and hydrocarbon detection systems in place. • Overbalanced drilling. • Flare and oil storage facilities in the event of an influx of hydrocarbons during drilling. • Normal pressure gradients anticipated based on study using nearby well data. • Notification to DNMA, ANP and AMSA and establishment of 500m exclusion zone around drillship.	A	4	Medium	5.3
Leak from fittings and connections	Equipment failure	Negligible	• Pressure tested equipment. • Planned maintenance programme.	B	1	Low	5.3
Refuelling incident	Localised and temporary acute and chronic toxic effects to sensitive resources Adverse effects on water quality	5	• Refuelling will be carried out under the Saipem Permit-To-Work system. • Refuelling will be undertaken only during periods of calm weather and preferably in daylight hours. • Transfer hoses will be fitted with 'dry break' couplings. • Refuelling operations will be overseen by the vessel's Master or First Officer.	C	2	Medium	5.3

Release Event	Cause	Maximum Spill Size (m^3)	Safeguards	Likelihood	Consequence	Residual Risk	Management Strategy
Vessel collision	Localised and temporary acute and chronic toxic effects to marine resources Adverse effects on water quality	80	• Hydrocarbons i.e. diesel likely to have high evaporation and dispersion rates. • Nearest shorelines are located over 80 km to the north, so any spill would be unlikely to reach shorelines. • Eni Incident Management Plan (IMP) and Oil Spill Response Manual (OSRM). • Oil spill response equipment on board drillship and available through OSRL. • Notification to DNMA and ANP, and establishment of 500m exclusion zone around drillship. • Automatic Radar Plotting Aids (ARPA).	A	3	Low	5.3
Leaks of hydraulic fluids	Localised and temporary acute and chronic toxic effects to marine resources Adverse effects on water quality	0.05	• Preventative maintenance. • Low toxicity hydraulic fluids used. • Manned operation (visual detection of release). • Drip pans/bunds.	D	1	Low	5.3
Chemical spills	Spills during transfers e.g. dropped bulk bin Spills during storage and handling	1	• Transfers will be carried out under the Saipem Permit-To-Work system. • Transfers will be undertaken only during periods of calm weather and preferably in daylight hours. • Transfer operations will be overseen by the vessel's Master or First Officer.	B	3	Medium	5.3

5. ENVIRONMENTAL MANAGEMENT STRATEGIES

5.1 OVERVIEW

This section of the EMP outlines the Environmental Management Strategies (EMS) in place to manage the potential impacts on the environment from the drilling of the Cova-1 well and to ensure compliance with all relevant regulations.

The environmental objectives defined in the EMSs are based on the identified environmental hazardous events, associated environmental effects and the assessed risks, corporate policies and performance commitments and applicable legal requirements. For the purposes of developing the EMSs for the drilling operations, environmental objectives, targets and key performance indicators (KPI's) are defined as follows:

Objective	Overall performance goal that, when achieved, ensures legal compliance and fulfilment of corporate performance commitments and standards.
Target	Specific, measurable performance goal against which actual performance can be measured.
KPI	Criterion used to measure performance against a reference target.

EMSs have been developed for six environmental hazards, as follows, and are presented in Sections 5.2 to 5.7 below:

- 5.2 Marine Discharges Management Strategy.
- 5.3 Hydrocarbon and Chemical Spill Management Strategy.
- 5.4 Atmospheric Emissions Management Strategy.
- 5.5 Marine Pests Management Strategy.
- 5.6 Marine Waste Management Strategy.
- 5.7 Marine Fauna Management Strategy.

5.2 MARINE DISCHARGES MANAGEMENT STRATEGY

MARINE DISCHARGES MANAGEMENT STRATEGY		
Applicable Activities		
• Drilling fluids and drill cuttings. • Deck drainage (from drillship and support vessels). • Laboratory wastes. • Cooling water. • Reject (brine) water. • Sewage, grey water and putrescible wastes (from drillship and support vessels). • Cement. • Disposal of BOP fluids. • Ballast water (from drillship and support vessels).		
Potential Environmental Effects		
• Increased turbidity in the water column. • Localised smothering of benthic fauna from drill cuttings. • Toxic effects of hydrocarbons and chemicals on marine biota or changes in habitat characteristics. • Physical coating or asphyxiation, or disruption of physiological or behavioural processes in marine biota by hydrocarbons. • Localised increases in environmental nutrient loading. • Localised reduction in water quality (e.g. including reduced dissolved oxygen and an increase in water temperature and salinity).		
Corporate Commitments		
• Set objectives and targets, implemented through appropriate programmes, thus ensuring the continual improvement in overall HSE performance. • Comply with relevant legislation and other requirements to which Eni Timor Leste subscribes or apply company standards where relevant laws and regulations do not exist. • Maintain a documented HSE Integrated Management System certified to ISO14001 which enables comprehensive reporting and review of performance. • Prevent pollution and minimise greenhouse gas emissions, effluents, discharges and other impacts on the environment while safeguarding our resources.		
Regulatory Requirements		
• MARPOL ANNEX I: Prevention of pollution by oil. • MARPOL ANNEX IV: Prevention of pollution by sewage from ships. • MARPOL ANNEX V: Prevention of pollution by garbage from ships. • APPEA Code of Practice 2008.		
Performance Objectives	**Targets**	**Key Performance Indicators**
• Water Based muds to be used for drilling	• Exclusive use of WBMs for drilling	• Records show that only WBM used for drilling

MARINE DISCHARGES MANAGEMENT STRATEGY		
• Minimise volume of drilling fluids discharged overboard, adhering to drill cuttings	• Maximum amount WBMs discharged overboard ≤15% of total volume used in the drilling program	• Volume of WBMs maintained onboard (compared with total volume used)
• Planned discharges to comply with MARPOL regulatory limits for hydrocarbons discharges to sea	• Zero discharges of hydrocarbons at concentrations above the MARPOL Annex I (Regulation 15) limit of 15 mg/L hydrocarbons	• Number of non-conforming discharges (exceeding 15mg/L oil-in-water)
• Sewage discharges to comply with MARPOL Annexes IV	• All sewage to be treated and discharged in accordance with MARPOL Annex IV (Regulation 11)	• Number of non-conforming discharges (non-compliance with MARPOL Annex IV (Regulation 11)
• Discharge of food scraps and putrescible wastes to comply with MARPOL Annex V	• All food scraps and putrescible wastes to be comminuted to <25mm and discharged in accordance with MARPOL Annex V (Regulation 3)	• Number of non-conforming discharges (non-compliance with MARPOL Annex V (Regulation 3)
Management Strategies		
• Drilling fluids, cement and other chemicals have been assessed and selected based on technical suitability and environmental credentials. • Project induction will emphasise the importance of preventing spills of hydrocarbons and chemicals. • Daily house-keeping inspections shall be conducted to ensure that decks are kept clean. • Onboard Spill Response Kits will be maintained on all vessels in strategic locations. • Oil soluble chemicals will be disposed to the drillship oil storage holds prior to transport to the mainland for disposal.		
Engineering (As-built) Controls		
• Cutting shakers onboard the drillship will minimise the amount of drilling fluids disposed of with the drill cuttings. • Deck drainage will be drained to oily water tanks and treated by approved separators. Separated oil will be pumped to holding tanks to be transferred to shore, while clean water will be tested prior to discharge overboard. • Drill floor drainage system catches any spills and reports to oil-in-water separator. • Oil soluble chemicals will be disposed to the drillship oil storage holds prior to transport to the mainland for disposal. • Sewage effluent will be treated in an extended aeration system and comminuted to pass through a screen of less than 25mm diameter prior to discharge. • Putrescible wastes will be comminuted to pass through a screen of less than 25mm diameter prior to discharge. • The cooling water discharge point is above sea level allowing for cooling and oxygenation as it falls.		

MARINE DISCHARGES MANAGEMENT STRATEGY
Operations Procedural Controls
• *Saipem 10000 Operations Manual* • *Eni Australia (2008). HSE Standard Environmental Considerations for Chemical Use. ENI-HSE-ST-024* • *Eni Australia (2008). HSE Standard Drilling Fluids and Cuttings. ENI-HSE-ST-026*
Environmental Performance Monitoring and Reporting Requirements
• Operational monitoring of emissions and discharges (refer to Section 6.6.1) • Incidents will be reported to DNMA, as soon as practicable, but within, 48 hours. A written report will then be submitted within three days using the Incident Report Form in Eni's procedure: *Hazard and Incident Reporting and Investigation*. • MARPOL 73/78 oil pollution incidents in Commonwealth of Australia waters will be reported to Eni and AMSA (via Australian Search and Rescue, AusSar) under Marine Notice 9/2004.

5.3 HYDROCARBON AND CHEMICAL SPILL MANAGEMENT STRATEGY

HYDROCARBON AND CHEMICAL SPILL MANAGEMENT STRATEGY		
Applicable Activities		
• Well integrity failure (blowout). • Rupture/ leakage from vessel fuel tanks (e.g. collision scenario). • Well-head damage in severe weather. • Leak of hydraulic fluids. • Refuelling incident (from drillship and support vessels). • Bulk chemical transfers (from drillship and support vessels). • Leakage of bulk process chemical containers.		
Potential Environmental Effects		
• Acute and chronic toxic effects of hydrocarbons and chemicals on marine biota or changes in habitat characteristics. • Physical coating or asphyxiation, or disruption of physiological or behavioural processes in marine biota by hydrocarbons.		
Corporate Commitments		
• Set objectives and targets, implemented through appropriate programmes, thus ensuring the continual improvement in overall HSE performance. • Comply with relevant legislation and other requirements to which Eni Timor Leste subscribes or apply company standards where relevant laws and regulations do not exist. • Maintain a documented HSE Integrated Management System certified to ISO14001 which enables comprehensive reporting and review of performance. • Prevent pollution and minimise greenhouse gas emissions, effluents, discharges and other impacts on the environment while safeguarding our resources.		
Regulatory Requirements		
• MARPOL ANNEX I: Prevention of pollution by oil. • APPEA Code of Environmental Practice 2008.		
Performance Objectives	**Targets**	**Key Performance Indicators**
• To prevent oil spills	• Zero incidents of spilled hydrocarbons	• Number of spills • Incident reports
• To prevent chemical spills	• Zero incidents of spilled chemicals	• Number of spills • Incident reports
Management Strategies		
• Project induction will emphasise the importance of preventing spills of hydrocarbons and chemicals. • Continuously monitoring for abnormal reservoir pressure parameters during drilling. • Overbalanced drilling and BOP in place.		

HYDROCARBON AND CHEMICAL SPILL MANAGEMENT STRATEGY
• The drill crew shall be trained and competent in emergency well control and oil spill response procedures. • Bridging document for well control procedures to clarify Eni and Saipem responsibilities. • Refuelling and chemical transfers to shall be carried out under Saipem's Permit-To-Work system. • Refuelling will be undertaken only during periods of calm weather and preferably in daylight hours. • Refuelling and transfer operations overseen by the vessel's Master or First Officer. • Chemical transport, handling, storage, use and disposal practices will comply with MSDSs. • Notification to DNMA, ANP and AMSA and establishment of 500m exclusion zone around drillship.
Engineering (As-built) Controls
• Blow Out Preventer tested prior to commencement of operations and regularly during operations. • BOP and hydrocarbon detection systems in place. • Flare and oil storage facilities in the event of an influx of hydrocarbons during drilling. • Pressure tested equipment. • Refuelling transfer hoses fitted with dry break couplings. • Chemicals stored in dedicated bunded areas. • Automated Radar Plotting Aids (ARPA). • *Saipem 10000* preventative maintenance programme.
Operations Procedural Controls
• *Saipem 10000 Operations Manual.* • *Eni Timor Leste S.p.A IMP.* • *Eni Timor Leste S.p.A OSRM (TL-HSE-PL-006).* • *Saipem 10000 SOPEP.* • *Cova-1 Drilling bridging document for well control procedures.* • *Eni Australia (2008). HSE Standard Hazardous Material Management. ENI-HSE-ST-009.* • *Eni Australia (2008). HSE Standard Environmental Considerations for Chemical Use. ENI-HSE-ST-024.*
Environmental Performance Monitoring and Reporting Requirements
• Operational monitoring of oil and chemical spill incidents (refer to Section 6.6.1) • Incidents will be reported to DNMA, as soon as practicable, but within, 48 hours (see Section 0). A written report will then be submitted within three days using the Incident Report Form in Eni's procedure: Hazard and Incident Reporting and Investigation. • MARPOL 73/78 oil pollution incidents in Commonwealth waters will be reported to Eni and AMSA (via Australian Search and Rescue, AusSar) under Marine Notice 9/2004.

5.4 ATMOSPHERIC EMISSIONS MANAGEMENT STRATEGY

ATMOSPHERIC EMISSIONS MANAGEMENT STRATEGY		
Applicable Activities/Events		
Sources of emissions of GHG, NOx, SOx and ODS: • Power generation. • Vessel, aeroplane, helicopter and vehicle engines. • Emergency flaring . • Refrigerants, Air Conditioning, Fire Suppression		
Potential Environmental Effects		
• Incremental increase in global atmospheric concentrations of GHG and resultant global warming. • Incremental increase in atmospheric NOx and SOx concentrations and resultant photochemical smog and acid rain. • Incremental increase in atmospheric ODS concentrations and damage to ozone layer.		
Corporate Commitments		
• Set objectives and targets, implemented through appropriate programmes, thus ensuring the continual improvement in overall HSE performance. • Comply with relevant legislation and other requirements to which Eni Timor Leste subscribes or apply company standards where relevant laws and regulations do not exist. • Maintain a documented HSE Integrated Management System certified to ISO14001 which enables comprehensive reporting and review of performance. • Prevent pollution and minimise greenhouse gas emissions, effluents, discharges and other impacts on the environment while safeguarding our resources.		
Applicable Regulatory Requirements		
• MARPOL ANNEX VI: Prevention of pollution by air pollution by ships. • APPEA Code of Environmental Practice 2008.		
Performance Objectives	**Targets**	**Key Performance Indicators**
• Minimise impacts of air emissions on the environment.	• GHG, NOx and SOx emissions reduced to ALARP	• Vessel International Air Pollution Prevention Certificate • Estimated volumes of GHG NOx and SOx emitted • Records show engines and equipment are serviced regularly and well maintained • Records show engines comply with MARPOL Annex VI (Regulation 13) • Records show sulphur content of diesel fuel used complies with MARPOL Annex VI (Regulation 14)

ATMOSPHERIC EMISSIONS MANAGEMENT STRATEGY		
• Avoid the release of ODS	• No releases of ODS (with the exception of Halon in the fire fighting system if required in an emergency)	• ODS inventory show that ODS onboard drillship complies with MARPOL Annex VI (Regulation 12) • Records of non-compliance (incidents of ODS discharge)
• Maintain records of all emissions	• All emissions to be recorded	• Records show that fuel usage and gas flaring reported • Fuel invoices maintained on file

Management Strategies

- Minimise GHG emissions by ensuring equipment is correctly specified and maintained in accordance with a planned maintenance programme.
- Except in an emergency, the flaring of petroleum products shall not be carried out without approval from DNMA.
- Selection of low sulphur diesel in line with MARPOL requirements to minimise SOx emissions.
- Fuel efficient use of machinery and vehicles will be implemented where possible (eg switching engines off instead of idling).
- An ODS inventory shall be maintained and reviewed to ensure compliance with MARPOL Annex VI (Regulation 12).

Engineering (As-built) Controls

- Vessel surveyed and issued with International Air Pollution Prevention Certificate

Operations Procedural Controls

- *Saipem 10000 Operations Manual*
- *Eni Australia (2008). HSE Standard Atmospheric Emissions. ENI-HSE-ST-027*
- *Procedure: HSE Data Monitoring and Reporting to Eni E&P Division (Eni-HSE-PR-007*

Environmental Performance Monitoring and Reporting Requirements

- Operational monitoring of emissions and discharges (refer to Section 6.6.1).
- All emissions will be reported to Eni.
- Flare emissions and fuel gas usage will be measured.
- Diesel usage recorded.
- Any release of ODS will be immediately reported to Eni.

5.5 MARINE PESTS MANAGEMENT STRATEGY

MARINE PESTS MANAGEMENT STRATEGY		
Applicable Activities		
• Control of marine pest species potentially carried in the ballast water or on the hulls of the drillship and support vessels.		
Potential Environmental Effects		
• Displacement or mortality (including predation) of native species in Timor Leste or Australian waters. • Direct competition for resources (food sources, habitat niches) with native species in Timor Leste or Australian waters. • Impacts of control measures upon native species in Timor Leste or Australian waters.		
Corporate Commitments		
• Set objectives and targets, implemented through appropriate programmes, thus ensuring the continual improvement in overall HSE performance. • Comply with relevant legislation and other requirements to which Eni Timor Leste subscribes or apply company standards where relevant laws and regulations do not exist. • Maintain a documented HSE Integrated Management System certified to ISO14001 which enables comprehensive reporting and review of performance. • Prevent pollution and minimise greenhouse gas emissions, effluents, discharges and other impacts on the environment while safeguarding our resources.		
Regulatory Requirements		
• Australian Quarantine & Inspection Service (AQIS) Ballast Water Management Requirements Ver4, 2008 (Commonwealth). • International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004. • Australian National Biofouling Guidance for the Petroleum Production and Exploration Industry (2009).		
Performance Objectives	**Targets**	**Key Performance Indicators**
• Prevent the introduction of marine pest species	• No introductions of marine pest species into Timor Leste or Australian waters	• Risk assessment indicates low risk • Current Antifouling Certification or Biofouling Record Book maintained • Ballast water transfer records

MARINE PESTS MANAGEMENT STRATEGY
Management Strategies
• Project induction will emphasise the importance of minimising the introduction of NIMS via ballast water and biofouling into Timor Leste and Australian waters. • Vessels mobilising from international waters will be vetted by Eni prior to arrival on site, including conducting a risk assessment of the introduction of NIMS via ballast water and biofouling. • Vessels are required to exchange ballast in accordance with AQIS approved methods and maintain records of ballast water exchange consistent with AQIS ballast water reporting requirements. • Ships' masters and crews are required to be trained in AQIS ballast water and ballast tank sediment management and treatment procedures, including the maintenance of relevant records and logs. • Vessels shall not discharge ballast water from an international source within Australia's or Timor-Leste's territorial seas (i.e. within 12nm of the coastal baseline) without the written approval of the relevant authority. • If a vessel is deemed a high risk via biofouling, inspections for exotic species will be undertaken prior to the vessel arriving at site. Inspections and vessel cleaning will be undertaken as per AQIS requirements as necessary. • Vessels are required to maintain its internal seawater systems free of biofouling and retain records of inspections, maintenance, treatments and monitoring performed. • Vessels are required to clean items periodically immersed in water prior to mobilisation from international waters and retain records of cleaning carried out.
Engineering (As-built) Controls
• Each vessel is required to have in place a current anti-fouling coating that complies with the applicable requirements of Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships and a Statement of Compliance.
Operations Procedural Controls
• *Saipem 10000 Operations Manual* • *Saipem 10000 Ballast Water Management Plan* • *Saipem 10000 Biofouling Record Book* • *Eni Australia (2009). HSE Standard Marine Pests & Quarantine Management. ENI-HSE-ST-034*
Environmental Performance Monitoring and Reporting Requirements
• Ballast water exchange records. • Antifouling records and certificate of IMO compliance. • Biofouling inspection and cleaning records (vessel hull, internal systems, submersible equipment)

5.6 MARINE WASTE MANAGEMENT STRATEGY

MARINE WASTE MANAGEMENT STRATEGY		
Applicable Activities		
• Management of hazardous and non-hazardous waste generated by the drillship and support vessels.		
Potential Environmental Effects		
• Marine pollution from inappropriate handling and disposal. • Long term liabilities associated with clean-up. • Inefficient waste reuse and recycling due to inappropriate waste segregation. • Increased loading on existing shore-based waste management facilities.		
Corporate Commitments		
• Set objectives and targets, implemented through appropriate programmes, thus ensuring the continual improvement in overall HSE performance. • Comply with relevant legislation and other requirements to which Eni Timor Leste subscribes or apply company standards where relevant laws and regulations do not exist. • Maintain a documented HSE Integrated Management System certified to ISO14001 which enables comprehensive reporting and review of performance. • Prevent pollution and minimise greenhouse gas emissions, effluents, discharges and other impacts on the environment while safeguarding our resources.		
Regulatory Requirements		
• MARPOL ANNEX V: Prevention of pollution by garbage from ships		
Performance Objectives	**Targets**	**Key Performance Indicators**
• No unauthorised overboard waste disposal	• Zero incidents of incorrect waste disposal	• Waste Disposal Records • Number of Non-conformance Incidents
• Ensure waste requiring disposal is consigned to appropriate disposal facilities	• Zero occurrences of inappropriate waste disposal reported by waste contractor	• Waste Disposal Records • Number of Non-conformance Incidents
• Maximise waste recycling and reuse	• All segregated recyclable waste to be consigned to recycling contractors	• Waste Disposal Records • Number of Non-conformance Incidents
Management Strategies		
• Project induction will emphasise the importance of implementing correct management of waste practices. • Hazardous waste will be collected and stored in a bunded, signed area, then transferred ashore for disposal • No garbage shall be disposed of over board.		

MARINE WASTE MANAGEMENT STRATEGY
Engineering (As-built) Controls
• Oily waste drainage and treatment systems to retain oily wastes onboard for onshore disposal. • Treatment systems onboard for sterilisation of sewage wastes and comminution of sewage and putrescible wastes to <25mm prior to discharge. • Dedicated waste segregation and storage areas for onshore disposal of solid and hazardous wastes.
Operations Procedural Controls
• *Saipem Operations Manual* • *Eni Australia (2008). HSE Standard Liquid and Solid Discharges. ENI-HSE-ST-023* • *Eni Australia (2008). HSE Standard Waste management. ENI-HSE-ST-025*
Environmental Performance Monitoring and Reporting Requirements
• Operational monitoring of waste streams (refer to Section 6.6.1). • Waste manifests to be sent onshore with waste from vessels. • Waste disposal records will be provided to Eni by waste management subcontractor. • Report waste handling incidents using the Incident Report Form in Eni's procedure: *Hazard and Incident Reporting and Investigation*.

5.7 MARINE FAUNA MANAGEMENT STRATEGY

MARINE FAUNA MANAGEMENT STRATEGY		
Applicable Activities		
Marine activities that may result in interaction with wildlife: • Support vessel traffic to and from the drillship. • Air traffic (helicopters). • Noise and vibration from vessels. • Night time lighting of drillship and support vessels. • Discharge of cuttings directly to seabed during riser-less drilling.		
Potential Environmental Effects		
• Disturbance to the migration, feeding and breeding of wildlife • Injuries or mortality of wildlife due to physical impact • Smothering of benthic organisms.		
Corporate Commitments		
• Set objectives and targets, implemented through appropriate programmes, thus ensuring the continual improvement in overall HSE performance. • Comply with relevant legislation and other requirements to which Eni Timor Leste subscribes or apply company standards where relevant laws and regulations do not exist. • Maintain a documented HSE Integrated Management System certified to ISO14001 which enables comprehensive reporting and review of performance. • Prevent pollution and minimise greenhouse gas emissions, effluents, discharges and other impacts on the environment while safeguarding our resources.		
Regulatory Requirements		
• APPEA Code of Environmental Practice 2008		
Performance Objectives	**Targets**	**Key Performance Indicators**
• Disturbance to wildlife to be minimised	• Zero incidents of physical harm to protected wildlife	• Number of wildlife harm incident reports
Management Strategies		
• Environmental induction will emphasise the importance of harming marine wildlife. • Interactions between vessels and cetaceans during the Cova-1 drilling program shall be consistent with the Australian National Guidelines for Whale and Dolphin Watching (2005). Watch will be maintained at all times on vessels under way. Should any cetaceans be observed in the vicinity of vessels all necessary care to avoid collisions will be taken. • The drillship shall be pre-loaded with supplies and drilling materials to the greatest extent possible to minimise the requirement for additional supply during the drilling program. • Helicopter flights will be conducted during daylight hours only, except in emergency or training situations. Helicopter flights will be conducted in accordance with the Australian National Guidelines for Whale and		

MARINE FAUNA MANAGEMENT STRATEGY
Dolphin Watching (2005) and will as far as practical under general civil aviation rules • not fly lower than 500m within a 500m radius of a whale or dolphin (no fly zone). • not hover over the no fly zone. • avoid approaching a whale or dolphin head on. • avoid flying directly over, or passing the shadow of the helicopter directly over a whale or dolphin.
Environmental Performance Monitoring and Reporting Requirements
• Post-drilling ROV survey undertaken to confirm the fate of riser-less drill cuttings on the seabed. • Report wildlife interaction incidents using the Incident Report Form in Eni's procedure: *Hazard and Incident Reporting and Investigation*

6. IMPLEMENTATION STRATEGY

6.1 INTRODUCTION

This section details the procedures that will be in place for the drilling of the Cova-1 well. These include responsibilities, training, reporting frameworks, mitigation & response activities and monitoring & auditing procedures which are intended to reduce environmental risk to ALARP and to ensure that environmental performance criteria are met.

6.2 MEASURES TO ENSURE ENVIRONMENTAL PERFORMANCE ARE MET

Drilling campaigns are the responsibility of Eni. Saipem will operate the *Saipem 10000* drillship on behalf of Eni. Eni representatives aboard the drillship will ensure that this EMP and the Eni HSE Policy are correctly implemented.

6.3 SYSTEMS, PRACTICES AND PROCEDURES

6.3.1 General

The project will be implemented under the umbrella of Eni's HSE Policy (Appendix A), which Saipem must abide by. Saipem will also be required to have in place formal, written systems, practices and procedures for management of HSE (and emergency response, including oil spill response). These systems, practices and procedures will be reviewed and determined to be acceptable by Eni prior to commencement of operations. An Eni representative will accompany the drillship for the duration of the drilling activity.

As the Operator, Eni will ensure that its personnel and contractors comply with all regulatory controls under the PSC, this EMP and other relevant legislation, as listed in Section 1.4.

Key aspects of Eni's environmental management strategies include:

- Eni's HSE Integrated Management System (ENI-HSE-IN-002);
- Eni *Saipem 10000* Drilling Campaign Incident Management Plan; and
- Eni Permit Area S06-03 Oil Spill Response Manual (TL-HSE-PL-006).

Key aspects of Saipem's environmental management strategies include:

- Saipem Emergency Response Manual - Offshore;
- Use of personnel with local area experience; and
- Compliance with the APPEA Code of Environmental Practice.

All Eni and contractor personnel will receive an environmental induction prior to the commencement of the drilling programme. The environmental induction will instruct personnel on the issues and management actions identified in this EMP.

6.3.2 Incident Management Plan

Eni's *Saipem 10000* Drilling Campaign Incident Management Plan (IMP) describes Eni's preparations for emergency response, including details on organisational structure, incident management protocols and investigation arrangements.

6.3.3 Oil Spill Response Manual and Resources

Eni's Permit Area S06-03 Oil Spill Response Manual (OSRM) (TL-HSE-PL-006) provides background on appropriate, and readily available, oil spill response strategies for the S06-03 permit area.

Eni is a shareholder and participant member of Oil Spill Response Limited (OSRL), an industry-owned response organisation that can provide equipment and expertise in the event of a tier 3 oil spill, and can assist with clean-up activities. In the south-east Asian region, OSRL maintains an inventory of equipment in Singapore, which can be mobilised at any time (24 hours per day, 365 days per year). Equipment available includes dispersant application boom systems, skimmers, and surveillance and communications gear.

6.4 CHAIN OF COMMAND AND ROLES AND RESPONSIBILITIES

6.4.1 Eni Incident Management Team Leader

The Eni Incident Management Team (IMT) Leader will be responsible for:

- resourcing and compliance with Eni's HSE policy;
- facilitating an emergency response strategy in the event of an incident;
- facilitating communication with company personnel, government and the media in the event of an incident; and
- ensuring overall compliance with the Eni EMP with advice from the Eni HSE Adviser.

6.4.2 Eni Representative onboard the drillship

The Eni Representative onboard the drillship will be responsible for:

- ensuring Saipem performs all operations in a manner consistent with the performance objectives detailed in this EMP;
- reporting all incidents through to Eni and notifying ANP in accordance with Eni's Procedure: Hazard and Incident Reporting and Investigation (Eni, 2007a);
- recording recordable incidences; and
- ensuring all personnel receive Eni's environmental induction prior to the commencement of drilling.

6.4.3 Drillship Offshore Installation Manager (OIM)

The Drillship OIM will be responsible for:

- ensuring all operations aboard the drillship are carried out in a manner consistent with this EMP;
- ensuring that Eni's HSE policy is followed;
- monitoring the performance against relevant environmental procedures legislative requirements, commitments, and conditions applicable to the drilling program;
- recording incident reports into the Eni database;
- ensuring all personnel are adequately trained, competent and have the ability to carry out duties as required in this EMP; and
- notifying the Eni Representative of any incidents arising from operations that may have an adverse impact on the performance objectives identified in this EMP.

6.4.4 Eni HSE Adviser

The Eni HSE Adviser will be responsible for:

- providing the Eni EMP to the Eni Managing Director;
- reviewing the drilling contractor's HSE Management Plans for acceptability and ensuring compliance with the Eni EMP;
- reviewing environmental audits to ensure compliance with the agreed environmental performance objectives; and
- providing advice in the event of an oil spill or other environmental incidents.

6.4.5 Eni Operations Manager

The Eni Operations Manager will be responsible for:

- supervising the Eni Drilling Manager; and
- interfacing between the IMT and the offshore Emergency Response Team (ERT) in the event of an emergency.

6.4.6 Eni Drilling Manager

The Eni Drilling Manager will be responsible for:

- supervising the Eni Representative;
- immediately notifying DNMA of any spill of hydrocarbons of greater than 80L;
- assisting the IMT Leader in the event of an emergency; and
- liaising with the Eni Operations Manager.

6.5 TRAINING, AWARENESS AND COMPETENCE

All Eni and contractor personnel will receive training on their environmental responsibilities in connection with the Cova-1 drilling campaign. The environmental induction will instruct personnel on the issues and management actions identified in this EMP.

6.6 ENVIRONMENTAL MANAGEMENT MONITORING, REPORTING AND AUDITING

6.6.1 Environmental Management Monitoring

Environmental monitoring will comprise:

- An ROV survey of the seabed in the vicinity of the Cova-1 well before and after drilling; and
- Operational monitoring of emissions and discharges to the environment that result from routine drilling activities.

The objective of the onboard environmental management monitoring program is to verify that all discharges and emissions to the environment are in accordance with this Environmental Management Plan.

ROV Survey

A pre-drill ROV survey will provide baseline images of the seabed surrounding the proposed well. During the drilling program, further ROV surveys will be undertaken. The ROV survey images will be reviewed to ascertain suitability and performance of the drilling operations in respect to the deposition of drill cuttings on the seabed and the effects of turbidity on marine fauna. A report on the findings of the ROV surveys will be provided to the DNMA within one month of well completion.

Operational Monitoring

The discharge of domestic wastes will be periodically monitored by the Eni representative to ensure that the performance standards in place for the activity will be met. All solid and hazardous wastes stored onboard and transferred onshore for disposal will be recorded in a waste manifest. Volumes of fuel used and crude consumed during operations will also be recorded on daily logs. Table 6.1 presents the operational monitoring program to be implanted during the Cova-1 well drilling program. Eni will submit a compliance report to DNMA, as required, outlining the results of its monitoring program.

Table 6.1: Operational monitoring

Environmental Risk	Criteria to be Monitored	Inspection
Drilling Chemicals	Chemical characteristics; Ecotoxicity; Biodegradability; Potential for bioaccumulation.	Prior to drilling
	Volume on board, volume used and volume discharged	Daily recorded in the operational log inspection
Drill floor drainage	All drainage directed to sumps ahead of oil-in-water separators	Prior to drilling and once during campaign
Laboratory Wastes	Type, usage, toxicity	Prior to and on completion of drilling
Chemicals and hazardous materials	Volume stored and volume consumed	Daily operational inspection of the storage area, management and transfer procedures and log sheet update
Sewage discharge	Correct operation of sewage treatment system	At start and once during campaign
General rubbish disposal	Volume of waste generated and volume transferred for onshore disposal	Prior to waste transfers to supply vessels
Hazardous waste disposal	Volume of waste generated and volume transferred for onshore disposal	Prior to waste transfers to supply vessels
Flared well fluids emission	Volume flared	Ongoing during flaring
Diesel usage	Volume on board and volume consumed	Daily operational log inspection and fuel transfer log sheet
Oil spills	Type and volume	Ongoing through daily operational log and incident reporting system
Chemical spills	Type and volume	Ongoing through daily operational log and incident reporting system

6.6.2 Reporting

Routine reporting

Eni will produce a Well/Project Completion Environmental Report which details the results of the ROV survey, the monitoring program outlined in Table 6.1 and any incidents that occurred during the campaign. The report will be provided to the DNMA within six weeks of well completion.

Incident reporting

All environmental incidents or deviations from the EMP will be reported in accordance with Eni's Procedure: *Hazard and Incident Reporting and Investigation*. Additionally, all incidents arising out of operations for the activity that are not within the parameters of the environmental performance standards in the EMP shall be reported.

DNMA shall be notified within 48 hours upon the occurrence of an:

- escape of discharge into the sea of a mixture of petroleum and water in which the petroleum concentration was greater than 25ppm;
- escape or discharge into the sea of more than 80L of petroleum, not being the above; and
- uncontrollable escape or ignition of petroleum or any other flammable or combustible material causing a potentially hazardous situation.

The written report will specify:

- the date, time and place of the occurrence;
- the quantity or approximate quantity of liquid that escaped or burned;
- particulars of damage caused by the escape or ignition;
- the events so far as they are known or suspected that caused or contributed to the escape or ignition;
- particulars of methods used to control the escape or ignition;
- particulars of methods used or proposed to be used to repair property damaged by the escape or ignition; and
- measures taken, or to be taken, to prevent a possible recurrence of the escape or ignition.

6.6.3 Surveillance Audit Program

The primary objective of the audit program is to ensure the requirements of the EMP, legislation and guidelines are being met. The results of the audits will be used to review environmental targets and to monitor their effectiveness.

Table 6.26.2 presents the proposed audit program.

Table 6.2: Proposed audit program

Audit	Audit Focus
Planning Stage (2 weeks prior to mobilisation to drilling site)	The objective of the audit is to ensure that the planned environmental strategies are in place prior to the commencement of the drilling activities. The audit will be a desktop and will primarily assesses compliance against: • The EIS, EMP, Contractor Management Systems and Plans and specific approval requirements; • Agency/stakeholder notification/consultation; • Necessary control measures/equipment and tools on board.
Drilling Stage (During drilling operation)	The objective of the operations audit is to verify that the EMP is being implemented during the drilling operation. The audit primarily: • assesses compliance against EMP requirements; identifies areas for improvement, • reviews the appropriateness/efficiency of mitigation measures and • recommends or suggests additional mitigation measures, as required.
Demobilisation Stage (1 week before demobilisation from site)	The objective of this audit is to ensure: • all wastes generated on board are properly disposed of, • ROV surveys have been conducted confirming that all materials/equipment have been removed from the drilling sites and to provide a record of post drill status.

Eni personnel or second party consultants will conduct the audit in accordance with Eni's Procedure: *HSE Auditing*. A report will be produced and non-conformances will be incorporated into the current and future campaigns.

6.7 REVIEW OF THE EMP

This EMP will be reviewed:

- when an environmental audit of the drilling campaign finds significant breaches of the EMP requirements; or
- if any significant new environmental risk or effect, or significant increase in an existing environmental risk or effect occurs that is not provided for in the existing EMP.

Any significant incident occurring during operations would also trigger a review of the EMP.

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APPENDICES

APPENDIX A

ENI HEALTH, SAFETY AND ENVIRONMENT POLICY

eni timor leste

Health, Safety & Environment Policy

In our hydrocarbon, exploration and production activities, Eni Timor Leste and its associated companies are committed to maintaining a strong and effective culture in Health, Safety and Environment (HSE) for everyone involved in our activities.

This policy applies to all operational and project activities under Eni Timor Leste's control, including activities carried out by contractors.

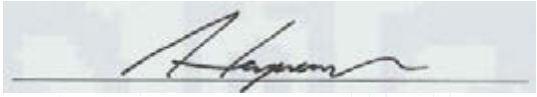
Eni Timor Leste will:

- ✓ Set Health, Safety and Environment as a core value for all business activities;
- ✓ Play a leading role in promoting best HSE practice throughout our activities;
- ✓ Set objectives and targets, implemented through appropriate programmes, thus ensuring the continual improvement in overall HSE performance;
- ✓ Implement safe working procedures and fitness to work programmes to pursue the goal of zero harm to anyone, anytime in an injury-free workplace;
- ✓ Comply with relevant legislation and other requirements to which Eni Timor Leste subscribes or apply company standards where laws and regulations do not exist;
- ✓ Assess and manage HSE risks across each life cycle for all business activities;
- ✓ Maintain a documented HSE Integrated Management System certified to ISO14001 which enables comprehensive reporting and review of performance;
- ✓ Include HSE performance in appraisal of staff and contractors;
- ✓ Prevent pollution and minimise greenhouse gas emissions, effluents, discharges and other impacts on the environment while safeguarding our resources; and
- ✓ Remain committed to sustainable development and the welfare of our host communities.

Eni Timor Leste expects that everyone recognises their personal responsibility for HSE and their right to report openly any HSE issue or concern. In addition, everyone is obliged to intervene in the case of unsafe acts or conditions.

To ensure we meet these objectives and respect the interests of those who may be affected by our operations, Eni Timor Leste will consult with, listen to and respond openly to all staff, contractors, regulators, customers and host communities.

Country Representative
Eni Timor Leste S.p.A.



Tony Heynen

24 March 2010

APPENDIX B

SAIPEM 10000 SPECIFICATION

Eni GROUP

Saipem

Drilling

Saipem 10000

Saipem 10000

The Saipem 10000 ultradeepwater drillship is the latest vessel to join Saipem's drilling fleet and represents an innovative and advanced addition to oil and gas exploration and production worldwide.
Built by Samsung Heavy Industries in its Koje shipyard in South Korea and completed in 2000, Saipem 10000 is a drillship for the new millennium.
The vessel has been designed and built to Class III Dynamic Positioning specifications making it capable of worldwide, year round operations.

The main operating areas for Saipem 10000 will be the US Gulf of Mexico, South Atlantic, West Africa and, during the summer weather window, the UK sector of the North Sea and West of Shetlands.
Saipem 10000 has been built to set a new standard in drilling activities. The vessel has been designed and completely outfitted to explore and develop hydrocarbon reservoirs down to 30,000 ft RKB, operating in water depths in excess of 10,000 ft in full DP mode.


Saipem
Saipem
SAIPEM 10000

Saipem 10000

BRIEF DESCRIPTION

The main operational modes of the vessel in DP are the following:

- drilling activities (exploration/appraisal/development);
- early production and extensive well production/testing;
- crude oil storage and offloading;
- well completion activities.

All of the equipment installed onboard the vessel has been designed to meet the most stringent health, safety and environmental standards.

Among the chief benefits gained through operating with the Saipem 10000 are the particular arrangement of drilling facilities, the high pay load capacity and its Extended Well Testing facilities.

The arrangement of the vessel's topsides equipment allows the drilling crew to conduct several activities simultaneously, thereby optimising the sequence of operations and reducing downtime between different phases. The Saipem 10000's pay load, recorded at more than 20,000 t, permits the loading of large quantities of consumables, reducing the necessity of frequent reloading and the number of required supply vessel trips and, consequently, cutting overall operating costs for the client. Saipem 10000 is fitted with Extended Well Testing facilities that allow for the storage of up to 140,000 barrels of crude oil and has offloading capabilities to avoid the need for flaring, thus limiting environmental impact whilst optimising cost.

INTEGRATED MANAGEMENT SYSTEM

The Saipem 10000 holds the ABS and 'ACCU' notation, meaning all vessel automation and instrumentation is in line with the unattended machinery space class requirements. Based on the operating philosophy of DP Class III, the Integrated Automated System (IAS) is fibre optic based and fully integrated with the drilling control system.

A dual data highway will carry signals to and from operator stations located in the bridge, cargo control centre and engine control room.

The main subsystems incorporated in IAS are the following:

- power generation/manoeuvring;
- auxiliary system control and monitoring;
- cargo/ballast;
- riser management system;
- serial interface with the following systems:
  - Drilling Integrated Systems (DIS);
  - gas detection systems;
  - tank level gauging system;
  - fire detection system;
  - emergency shutdown system.

ACCOMMODATION

The accommodation module, built in accordance with ABS regulations, has been designed to accommodate 172 people with a high degree of comfort and includes two recreation rooms, coffee shop, sauna and gymnasium.

Vessel specifications

UNIT TYPE
Ultra deep water drillship, equipped with EWT (Extended Well Testing), designed for exploration and development drilling down to 30,000 ft RKB, operating in water depth in excess of 10,000 ft

UNIT FLAG
Bahamas

UNIT CLASSIFICATION
ABS +A1(E), "Drilling Unit", +FPSO, +AMS, +ACCU, +DPS-3, OMBO, DLA, +CDS

UNIT DESIGN
Samsung

YEAR OF UNIT CONSTRUCTION
1999-2000

UNIT POSITIONING SYSTEM
Simrad SDP-32, DP class III

DIMENSIONS	
Displacement	96,455 t
Length overall	228 m
Length between perpendiculars	219.4 m
Breadth, moulded	42 m
Depth, moulded	19 m
Operating draught, moulded	12 m
Transit draught, moulded	8.3 m

STORAGE CAPACITIES	
Fuel	42,500 bbls
Drilling water	18,157 bbls
Potable water	6,704 bbls
Mud (active & reserve)	12,300 bbls
Brine	3,000 bbls
Oil base mud	3,000 bbls
Bulk bentonite/barite	16,000 cu.ft
Bulk cement	18,500 cu.ft
Crude oil	140,000 bbls

Vessel specifications

Vessel specifications

OPERATIONAL CAPABILITIES
Water depth capability in excess of 10,000 ft
Drilling depth 30,000 ft RKB

Variable load in transit mode
With crude oil: 20,000 t. Without crude oil: 17,000 t.
Variable load in drilling mode
With crude oil: 18,000 t. Without crude oil: 20,000 t.
Variable load in survival mode
With crude oil: 15,000 t. Without crude oil: 20,000 t.

CRANES
4 Hydralift Knuckle Boom Cranes.
Rated capacity 85 t. at 18.4 m

PIPE RACK OVERHEAD CRANE
1 Hydralift Catwalk machine (loaded by Knuckle Boom Crane)

RISER RACK OVERHEAD CRANE
1 Hydralift Catwalk machine (loaded by Knuckle Boom Crane)

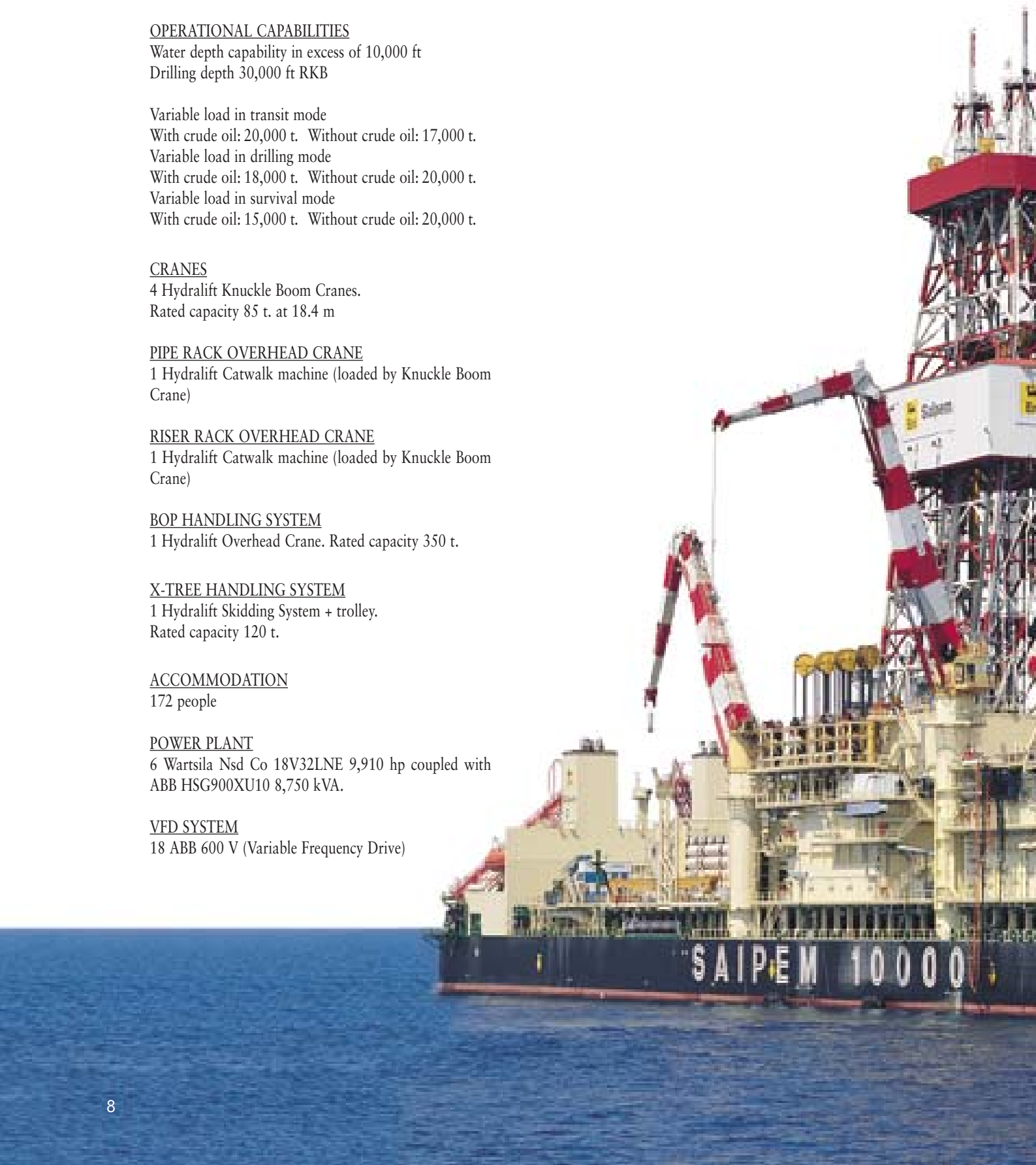
BOP HANDLING SYSTEM
1 Hydralift Overhead Crane. Rated capacity 350 t.

X-TREE HANDLING SYSTEM
1 Hydralift Skidding System + trolley.
Rated capacity 120 t.

ACCOMMODATION
172 people

POWER PLANT
6 Wartsila Nsd Co 18V32LNE 9,910 hp coupled with ABB HSG900XU10 8,750 kVA.

VFD SYSTEM
18 ABB 600 V (Variable Frequency Drive)




Saipem
SAIPEM 10000

Drilling rig specifications

ons

Derrick	Bailey	Dynamic	base 80 x 60 ft
			top 60 x 20 ft
			height 200 ft
		Static hook load	2,000,000 lbs
Substructure/Rig Floor	Simultaneous setback and hook load capacity 2,600,000 lbs		
Racking Platform	Hydralift	6⅝" D.P.	252 joints Range III
		plus 5" D.P.	121 joints Range III
		plus 9½" D.C.	6 Stands
		plus 8¼" D.C.	12 Stands
		plus 6¾" D.C.	6 Stands
		plus 4¾" D.C.	10 Stands
		13⅜" Casing	80 Stands in triple
		or 9⅝" Casing	105 Stands in triple
		or 7" Casing	105 Stands in triple
Automatic Drill Pipe Racking system	Hydralift	Vertical Column Type capable to handle from 3½" D.P. to 13⅜" Casing	
Casing Stabbing Board	Hydralift	Hydraulic basket adjustable from rig floor up to 16 m	
Derrickman PLTF-TV	Located on upper and lower finger board with monitors located in the driller's house and TV net. Capable to camera system zoom, pan and tilt.		
Drawworks	Wirth GH 4500 EG 4,500 hp, Re-generative Braking + Baylor 7838 + disk brake + back up disk brake. Powered by 3 General Electric GEB 22A1, AC.		
Crown Block	Hydralift	Rated capacity	907 t
		Sheaves	8 x 2" drilling line
Travelling Block	Hydralift	Rated capacity	907 t
		Sheaves	7 x 2" drilling line
Hook Block	Hydralift	Integrated with travelling block	
Swivel Head	Hydralift	Integrated with Top Drive	
Motion Compensator	Hydralift	Crown mounted equipped with Active Heave Compensation System	
		Rated capacity compensated	450 t
		Rated capacity locked	907 t
		Stroke	25 ft
Rotary Table	Wirth RTSS 60½" hydraulic	Maximum opening	60½"
		Rated capacity	907 t
		Driven by	Hydraulic motor
Top Drive	Hydralift HPS 750 2E	Rated capacity	680 t
		Driven by	2 x GEB 752 22 A1AC
Mud pumps	Wirth TPK 2200	4 triplex pumps, 2,200 hp each with 7,500 psi fluid end	
Cementing unit	BJ Services	SCP 248/RAM	
		Driven by	2 x Caterpillar 3406 B
Shale shaker	Brandt	6 VMS 300	
Desander and Desilter	Gann Mekaniske Brandt	2 installed	16 M - 3 x 12"+
			16 M - 16 x 8"
Dryer	Brandt	1 Vortex Finder	
Degasser	Burgess	1 installed	Magnavac 1500
BOP Stack	Shaffer	18¾" - 15,000 Guidelineless with Vetco HD-H4 Bop Connector	
Riser	Abb Vetco Gray	3,000 m w.d. Type HMF 21" o.d. x 90 ft long	
Diverter	Abb Vetco Gray	KFDS Type CSO	
Riser Tensioners	Hydralift	16 x 200,000 lbs type 65' Line Travel	
BOP control system	Shaffer	Multiplex with 5,000 psi Accumulator Unit	

Saipem

Ideas, as strong as man.

Saipem SpA - Via Martiri di Cefalonia, 67 - 20097 San Donato Milanese (MI) - Italy - Tel. +39 02 520.1 - Fax +39 02 520.44667
www.saipem.eni.it

APPENDIX C

SEA WITCH SPECIFICATIONS

Sea Witch

IMO no:	9392975
DNV id no:	27353
MMSI:	212 590 000
Call sign:	5BLT2

MAIN DESCRIPTION		MEASUREMENT	
Type :	UT 755 L	Lenght oa :	71,90 m
Classification :	DNV +IAI,SF E0 Clean	Lenght bpp :	66,00 m
	Dynpos-Auto	Breath moulded :	16,00 m
Yard :	Cochin Shipyard LTD	Depth moulded	7,00 m
Place built :	Cochin	Draugth max :	5,83 m
Country built :	India	Gross tonnage GT :	2100
Delivered :	Nov '08	Correspondign DWT :	3250 mt
Flag :	Cypros	Net tonnage NT :	1150
Port of registry :	Limasol	Speed svc/max.	14,3 Knots
Owner :	Dess Cypros LTD	ISM-Responsible :	Thome Management PTE LTD

CARGO CAPACITY		DISCHARGE RATE	
Deck cargo:	1600 t	Fuel discharge rate :	1 off 200 m3/h - 9 bar
Deck area:	680 m2	Mud discharge rate :	2 off 75 m3/h - 18 bar
Deck strength:	5,0 t / m2	Brine discharge rate :	1 off 75 m3/h - 18 bar
Fuel (gasoil) :	1000 m3	Drillwater discharge rate :	1 off 200 m3/h - 9 bar
Liquid Mud :	970 m3	Dry bulk discharge rate :	2 off 27 m3 min 5,6 bar
Brine :	390 m3	Base Oil discharge rate :	1 off 150 m3/h - 9,0 bar
Drillwater/Ballast :	850 m3	Fresh Water discharge rate :	1 off 200 m3/h - 9 bar
Base Oil :	200 m3		
Dry Bulk :	315 m3 (11250 cuft)		
Fresh Water :	840 m3		

MACHINERY / PROPULSION			
Main Engine set :	2x2725 bhp /825 rpm	Stern Thruster :	1 off 590 Kw (800 bhp)
Propellers :	2 off Ulstein CPP		
Rudders :	2 off T1650	Generators :	2 x 1280 kW Shaft
Total BHP :	5450 BHP	Diesel Generators :	2 x 250 kW
Total Kw :		Emergency Generator :	1 x 72 kW
Bow Thrusters:	2 off 590 kW (800bhp)	Shore Connection:	440 v ,60 Hz

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Sea Witch

PERFORMANCE / CONCUMPTION

Max Speed/Consumption :	14,3 Knots/ 20 t
Service Speed/Consumtion:	11,0 Knots / 17 t
Economical Speep/Consumtion :	9.0 Knots / 14 t
Standby Mode :	2-3 knots / 4t
Port Consumption :	
Roll reduction system :	4 off ulstein passive roll red.tanks

ACCOMODATION

The vessel to have accommodation and equipment for 10 officers / crew and 12 passengers as follows:

Tween deck:	2 off 4-men cabins
Main deck:	1 off Change / Washroom
	1 off Toilet room/ 1 off Spare room
F.C.-deck	Galley and provision rooms Mess and dayroom
	1 off Laundry/ Drying room, 1 off store room
A-deck	5 off 1-bed cabins for crew
	1 off 4-men cabin/ 1 off Aircond. room
B-deck	5 off 1-bed cabins for officers/crew
Bridge deck	Wheelhouse, Toilet room

DECK

Tugger Winch :	Brattvaag 2 off 10 t
Deck Crane :	3t/10-16m TTS-GPT 115
Windlass:	Brattvaag PH SNF 210-40
Capstans:	Brattvaag 2 off 8 t CMX2208

Two off starting air compressors. Sperre HL2 / 105
Two off starting air bottles.
One off instrument air drier, one instrument air tank.
Two off Bilge/fire pumps. All Weiler AEB1E0750-IE
One off Bilge water separator.
Four Reefer plugs Two 440V + Two 220V
CO2 fire fighting system in engine room.

RESCUE EQUIPMENT

Fire Fighting equipment :	Wather Mist. External Fire system	Survival Suits :	22 persons
MOB Boats:	1x Viking	Life jackets :	22 persons
Radar transponders :		Life rafts:	4 Viking
Emergency Beacon:	2 Off JRC.VHF406 MHz		

NAVIGATION AND COMMUNICATION EQUIPMENT

Dynamic Position :	AUT (DP1) Kongsberg	GMDSS Sea Area:	A3
Radar 3 cm:	JRC.JMA 9922 SXA	MF/HF Radio :	JRC.JSS - 296
Radar 10 cm:	JRC.JMA 9932 SA	DSC Receiver :	JRC.JHS - 32B
Radar Slave :	One on aft bridge	VHF 1 :	JRC.JHS - 7
Direction Finder :	John Lillie & Gillie LTD	VHF 2:	JRC.JHS - 7
Gyro:	Tokimec Inc -TG- 8000	VHF 3 :	JRC.JHS - 7
Autopilot:	Tokimec Inc -Pr-6114A-22	Portabel UHF :	4x JRC.JHS - 430
Navtex :	JRC.NCR - 333	Mobil Telephone :	Yes
Joystick :	Poscon(RRM)	Iridium :	Inmarsat Fleet 77
AIS :	JRC.JHS - 182	Mini-M :	Imarsat JRC.JUE 85
Echo Sounder :	JRC.JFE 585	Sat C 1 :	JRC.JQE-3A
Speed log :	JRC.JLF 205	Intercom System :	Yes
Satellite Navigator (GPS)	DGPS.JRC.JRL-77MK2		
Wind Sensors:	John Lillie & Gillie LTD		

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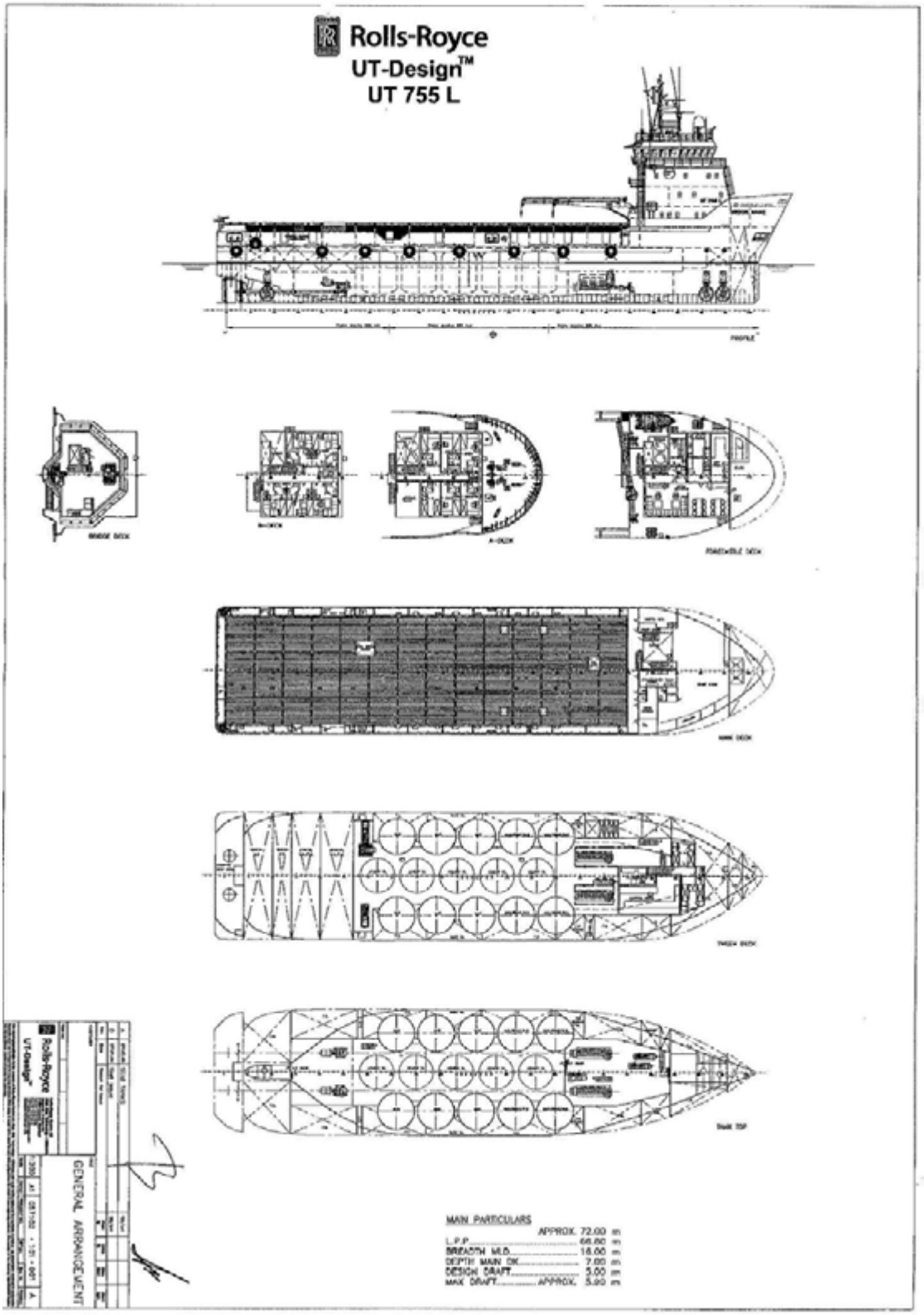

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