SundaGas Banda
Unipessoal Lda

ENVIRONMENTAL IMPACT STATEMENT (EIS)
DRILLING ACTIVITIES
PSC TL-SO-19-16

Decree Law No. 39/2022 1st Amendment of Decree Law No. 5/2011 – Environmental Licensing

Ministerial Diploma No. 46/2017

Halona Serena Lda

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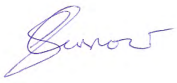
SundaGas Banda
Unipessoal Lda

Halona Serena Lda

PREPARED BY

Position	Name	Signature/Date
Halona Serena, Lda	Maria do Ceu Rosales	

APPROVED BY

Position	Name	Signature/date
SGBU HSSE Manager	Brian Foley	 Digitally signed by Brian Foley DN: cn=Brian Foley, o=Sundagas Banda Unipessoal Lda, ou=HSE Manager, email=Brian.Foley@sundagas.com, c=TP Date: 2025.05.30 17:06:38 +10'00' Adobe Acrobat version: 2025.001.20428
SGBU Well Operations Manager	Sean Curnow	 cn=Sean Curnow, o=Well Operations Manager, ou=SundaGas Ltd, email=sean.curnow@sundagas.com, c=VN 2025.05.30 14:26:32 +07'00'
SGBU General Manager	Dino Gandara	 cn=Dino Gandara, o=SundaGas Ltd, ou=Technical Manager, email=dino.gandara@sundagas.com, c=TP 2025.05.30 16:21:35 +09'00'
SGBU Managing Director	Dr. Andy Butler	 Andy Butler cn=Andy Butler, o=SundaGas Banda Unipessoal Lda, ou=Managing Director, email=andy.butler@sundagas.com, c=SG 2025.05.30 15:46:47 +08'00'

REVISIONS

Revision	Date	Author	Description
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Revision 1	30 May 2025	Halona Serena, Lda	Final Draft
Revision 2			

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ABBREVIATIONS

ADB	:	Asian Development Bank
AHT	:	Anchor Handling Tug
AMOSC	:	Australian Maritime Oil Spill Centre
AMSA	:	Australian Maritime Safety Authority
ANP	:	*Autoridade Nacional do Petróleo*
ANZG	:	Australian and New Zealand Guidelines
AOF	:	Absolute Open Flow
APORTIL	:	*Autoridade Portuário Timor-Leste*
ATSEA	:	Arafura & Timor Seas Ecosystem Action
ATS	:	Arafura and Timor Seas
BMSL	:	Below Mean Sea Level
BOD	:	Biological Oxygen Demand
BoM	:	Bureau of Meteorology
BOP	:	Blow Out Preventer
BTEXN	:	Benzene, Toluene, Ethylbenzene, Xylenes, and Naphthalene
CSO	:	Civil Society Organizations
CTD	:	Conductivity, Temperature, and Depth
DAFF	:	Department of Agriculture, Fisheries and Forestry
DEWHA	:	Department of the Environment, Water, Heritage and the Arts
DGV	:	Default Guideline Value
DNCPIA	:	*Direcção Nacional do Controlo Polução e Impacto Ambiental*
DST	:	Drill Stem Test
EBS	:	Environmental Baseline Survey
EDTL	:	*Eletrisidade de Timor-Leste/*Timor-Leste Electrical Company
EEZ	:	Exclusive Economic Zone
EHS	:	Environmental, Health and Safety
EIA	:	Environmental Impact Assessment
EIS	:	Environmental Impact Statement
ESIA	:	Environmental and Social Impact Assessment
ENSO	:	El Niño-Southern Oscillation
EMP	:	Environmental Management Plan
ESD	:	Emergency Shut Down
FPSO	:	Floating Production, Storage and Offloading
G&G	:	Geology and Geophysics
GHG	:	Green House Gases
GoTL	:	Government of Timor-Leste
GTL	:	Gas-to-Liquid
HAZID	:	Hazard Identification
HAZOP	:	Hazard and Operability Study
HSE	:	Health, Safety & Environment
HSEQ	:	Health, Safety, and Environment Quality

IBAs	:	Important Bird Areas
IFC	:	International Finance Corporation
ILO	:	International Labour Organization
IOGP	:	International Association of Oil and Gas Producers
IUCN	:	International Union for Conservation of Nature
ITCZ	:	Inter-Tropical Convergence Zone
ITF	:	Indonesian Throughflow
INSTANT	:	International Nusantara Stratification and Transport Program
JPDA	:	Joint Petroleum Development Area
LFPR	:	Labour Force Participation Rate
LNG	:	Liquified Natural Gas
LOR	:	Limit of Reporting
LTMO	:	Low Toxicity Mineral Oil
MAF	:	Ministry of Agriculture and Fisheries
MD	:	Measured Depth
MDKB	:	Measured Depth Below Rotary Kelly Bushing.
MFV	:	Monitoring Fishing Vessel
MODU	:	Mobile Offshore Drilling Unit
MoU	:	Memorandum of Understanding
MSL	:	Mean Sea Level
MPAs	:	Marine Protected Areas
MuTek	:	MuTeknologi Software
NADF	:	Non-Aqueous Drilling Fluid
NE	:	Northeast
NOPSEMA	:	National Offshore Petroleum Safety and Environmental Management
NT	:	Northern Territory
NW	:	Northwest
OBM	:	Oil Based Mud
OCNS	:	Offshore Chemical Notification Scheme
OIW	:	Oil-in-Water
OOC	:	Oil-on Cuttings
OSCP	:	Oil Spill Contingency Plan
OTL	:	*Oras Timor-Leste*
PAH	:	Polycyclic Aromatic Hydrocarbon
PD	:	Project Documents
PNTL	:	*Polícia Nacional Timor-Leste*
PSC	:	Production Sharing Contract
PSD	:	Particle Size Distribution
Q1, Q2, Q3, Q4	:	Fiscal Quarters
ROV	:	Remotely Operated Vehicle
RT	:	Rotar Table
SAQP	:	Sampling and Analysis Quality Plan

SBM	:	Synthetic Based Mud
SDP	:	Strategic Development Plan
SDS	:	Safety Data Sheet
SE	:	Southeast
SG	:	Specific Gravity
SW	:	Southwest
SundaGas/SGBU	:	SundaGas Banda Unipessoal Lda
SSS	:	Sea Surface Salinity
SST	:	Sea Surface Temperature
TD	:	Total depth
TG	:	TIMOR GAP Chuditch Unipessoal Lda
THR	:	Total Hydrocarbon Recoverable
TL	:	Timor-Leste
TLEA	:	Timor-Leste Exclusive Area
TOR	:	Term of Reference
TSS	:	Total Suspended Solid
TVD	:	True/Total Vertical Depth
TWT	:	Two Way Time
UN	:	United Nations
UNDP	:	United Nations Development Programme
UNFPA	:	United Nations Population Fund
UNTL	:	*Universidade Nasional Timor-Lorosa'e* (Timor-Leste National University)
UPF	:	*Unidade Polícia Fronteira*
WBM	:	Water Based Mud
WHO	:	World Health Organization
ZOCA	:	Zone of Corporation Area

MEASUREMENT UNITS

Bcf	Billion cubic feet
Bbl	Barrel
BOPD	Barrel of Oil per Day
dB	Decibel
Degree	Celsius
HP	Horse Power
Hz	Hertz
km	kilometre
km^2	kilometre square
km/h	kilometre per hour
kn/kt/kts	knot/knots
m	metre
mm	millimetre
mmscfd	Millions cubic feet per day
m/s	metres per second
μPa	micro Pascal (10^{-6})
Nm	Nautical mile
ppm	part per million
TC/TCs	Tropical cyclones
Tcf	Trillion Cubic Feet
%	Percentage

1. EXECUTIVE SUMMARY

1.1. Introduction

SundaGas Banda Unipessoal, Lda (SGBU) and TIMOR GAP Chuditch Unipessoal, Lda (TIMOR GAP) were awarded a Production Sharing Contract (PSC) by Petroleum National Authority *(Autoridade Nacional do Petróleo-ANP)* in 2019 to conduct petroleum activities in Timor- Leste's offshore. The contract area for PSC-TL-SO-19-16 covers approximately 3,571km^2. This contract area is located in Timor Sea, about 80km south of Greater Sunrise Gas field and 140km East-Northeast of Bayu-Undan production facility.

SGBU is planning to construct an appraisal well, Chuditch-2, based on the interpretation of reprocessed 3D 'Kyranis' seismic data (TGS, 2021 & 2022), using a suitably designed and capable self-elevating jack-up rig. Following the completion of a site survey for Chuditch-2, the appraisal well is expected to be drilled in approximately 68m water depth and to a target depth of approximately 3,010m Total Vertical Depth (TVD) in the Plover Formation.

The drilling campaign is scheduled during Q3 of 2025, and it is expected to last 44 days. The appraisal well aims to evaluate the hydrocarbon resources within the Chuditch field to facilitate future production planning. The study also incorporates previous geophysical and geotechnical surveys, drilling cuttings modelling analysis, mud dispersion modelling, oil spill modelling, and well abandonment design.

The Chuditch-2 Appraisal Well Project Document (PD) submission was approved by the ANP on 15 November 2023 and determined to fall within 'Category A' (having the potential to generate significant environmental impacts). As prescribed by Ministerial Diploma No. 46/2017, an Environmental Impact Assessment (EIA) will be conducted to assess major impacts for the duration of the drilling campaign and to assist in the design of Environmental Impact Statement (EIS), Environmental Management Plan (EMP), and Environmental Monitoring Program.

1.1.1 Objective of EIS

The main objectives of the EIS are:

- To evaluate, identify, and assess potential environmental risks associated with the offshore drilling campaign;
- Developing mitigation strategies to minimize negative environmental impacts;
- Ensuring compliance with Timor-Leste's environmental laws and international best practices; and
- Facilitating transparency and stakeholder engagement through public consultations.

The EIA findings will guide the formulation of an EIS, EMP, and an Environmental Monitoring Program to ensure continuous compliance throughout the appraisal drilling life cycle.

1.2 Summary of EIS Activities

1.2.1 Scope of EIS

The scope of this EIS is focused on the proposed appraisal drilling project, well testing, and does not extend to the potential future oil and gas activities in the Timor Sea by SGBU as the proponent.

The EIS study will examine the potential impacts of the proposed appraisal drilling and well testing activities on the seawater, marine life, sediment quality, air quality, and associated activities as outlined in the approved Terms of Reference (ToR) to carry out the EIA study to produce the EIS and EMP for the proposed project.

The evaluation and assessment of impact were mainly based on:

- Comparison with laws, regulations, national and international standards with reference to criteria for environmentally sensitive areas, conservation, and protection of endangered and endemic species;
- Consistency with policy and objectives such as socio-economic development; and
- Consultation and acceptability with the relevant authorities.

The EIS also presents measures and recommendations for the mitigation of any potentially adverse impacts identified based on the information gathered. These include primary and secondary data, publications and other available documents pertaining to the environmental status of the site.

1.2.2 Methodology of EIS

The study methodology of the EIS consists of the following:

- Public Consultation;
- Environmental Baseline studies information as approved by ANP for scope of Chuditch-2 EBS study and in-situ measurements of selected environmental quality parameters;
- Interview and discussions with stakeholders and local community;
- Discussion with relevant authorities; and
- Review of historical information and secondary data.

An Environmental Management Plan (EMP), which addresses the resources to perform the mitigating measures has been prepared in a separate document. The EMP will outline the environmental management practices and environmental quality monitoring program along with the roles and responsibilities, timelines, etc.

1.3 Alternatives and Justification of the Project

A "No Project" scenario is not viable, as drilling is essential to confirm the commercial viability of gas reserves in PSC TL-SO-19-16. Confirmation of commercial resources and their future development would reduce reliance on energy imports and provide future export earnings for the nation of Timor-Leste. There are no alternative technologies to access subsurface hydrocarbons without drilling.

An original Chuditch-2 well site was selected (4.8km from Chuditch-1) but proved unsuitable following surveying of the proposed drilling area in 2024, due to seafloor ridges and mounds, which could impact benthic habitats and caused issues with safe rig positioning. A new location, 286m further east, was selected as it offered a flatter seabed with minimal environmental impact. Further relocation is not feasible due to geological constraints, environmental equivalence, and cost implications.

The selected Chuditch-2 well location is the optimal choice for minimizing environmental impact while ensuring technical and economic efficiency.

1.4 Environmental Description

This section provides the environmental description that will be impacted by this Appraisal drilling project.

1.4.1 Physical Components

1.4.1.1 Climate and Rainfall

The Bonaparte Basin and Timor Sea region experience a tropical climate and distinct summer monsoonal 'wet' season from October to March and followed by a typical cooler winter 'dry' season from April to September.

Given that the appraisal drilling is scheduled for Q3 2025, it will fall within the dry season, when Easterly winds result in drier and warmer conditions with very little rainfall (RPS, 2024).

The mean annual rainfall is 1,770mm, with temperature variations between 24.9°C in July and 29.6°C in December.

1.4.1.2 Oceanography and Wind

The Chuditch location is near the Exclusive Economic Zone (EEZ) boundary between Timor- Leste and Australia, experiencing semi-diurnal tides that influence water movement and ecological interactions. The seabed in the vicinity of proposed drilling well lies between 60 to 80m below mean sea level.

Generally, south-westerly surface waves occur from December to March and easterly surface waves from April to October. Wind-driven currents cause seasonal variations that impact circulation, with speeds highest in September and lowest in April. Tidal variations range from 0.8m (neap) to 7m (spring tides), influencing sediment transport and nutrient cycling.

1.4.1.3 Seismicity and Tsunamis

The contract area lies in the southern part of the Timor Trough on the Australian continental plate, which subducts northward under Timor. The subduction zone is steeply dipping, with higher activity rates observed to the east toward the Banda Sea compared to the west toward Sumbawa. While seismic activity is currently absent in the northwest, this may not be a long-term feature. Subduction-zone earthquakes in the Timor Trough are shallow at the offshore trench and deepest to the north, with most occurring at depths up to approximately 200km.

1.4.1.4 Geology

The Chuditch-2 well targets the Jurassic Plover Formation, characterized by fluvio-deltaic sandstones and mudstones. The estimated reservoir depth is 2,813m TVD-MSL, with a gas-water contact at 2,920m. The stratigraphy includes the Plover Formation with sandstones and claystones, the Flamingo Formation has marine shales and turbiditic sandstones, and the Bathurst Island Group include claystones and calcareous sediments.

1.4.1.5 Air

The offshore air quality is normally good in an offshore location. Emissions from shipping, drilling and other offshore activities will contribute to localized air pollution. The appraisal drilling program has a short duration of about 44 days. The diesel driven power generators generate some pollutants, namely SO_2, NO_x, and CO which will be discharged into the atmosphere through exhaust stacks of suitable heights and will be localized. Therefore, impacts of gaseous pollutants on the ambient air quality due to drilling operations are insignificant and transient at the remote location, approximately 240km from the shores of both Timor-Leste and Australia. The impact of pollutants discharged in exhaust gases from the diesel driven power generators of drilling in an offshore area would be minimal. The generators are maintained as per manufacturers specifications.

1.4.1.6 Marine Water

Marine water quality sampling was conducted for the Chuditch-2 Environmental Baseline Survey (EBS) and test results provided in a technical report dated March/April 2025 carried out by WA Marine Pty Ltd trading as O2 Marine, Western Australia.

The water quality profiling studies indicated minimal spatial variability in water quality across the project area, temperature, salinity, turbidity, and pH remained stable from surface to seafloor, there was a slight thermocline detected at 22–25m depth. The dissolved oxygen (DO) levels were high (~95%) but decreased slightly below 25m, indicating a stratified water column and showed low turbidity levels which indicate minimal sediment resuspension and particulate matter.

The Environmental Baseline Survey confirmed high dissolved oxygen and low pollutant levels, heavy metals, hydrocarbons, and oil & grease were below detection limits in water samples.

1.4.1.7 Sediment

The sediments in the Timor Sea are dominated by fine sand, silt, and clay.

The analytical summary of the EBS around the proposed Chuditch-2 locations is as follows:

- Particle Size Distribution (PSD) were clay (<4 µm), silt (4-62µm), sand (62-250µm), medium sand (250-500µm), and coarse sand (500-2000µm). Sediment PSD was generally uniform across sampling locations, where coarse grained sand (500µm-2,000µm) was typically the most dominant fraction, followed by silt (4µm-62µm). Medium grained sand generally comprised the lowest fraction of grains across all sample sites, and while no sites appeared to be significantly different in their PSD composition.
- The dissolved metals results for gold, mercury and manganese results were reported below the LOR in all samples and for the remaining metals (As, Ag, Ba, Cd, Co, Cu, Cr, Fe, Pb, Mn, Hg, Ni, Sb, Se, and Zn) the results were all generally reported at low concentrations below ANZG (2018).
- The moisture content of sediment samples ranged between 33% and 44%. The median moisture content across all sample sites was 39%, while there was a low standard deviation in % moisture content between samples (2%).
- The oil and grease results were generally reported below the LOR (<500 mg/kg) however oil and grease were detected in low concentrations except at two sites were testing revealed levels of 690mg/kg and 630mg/kg.
- The sulphur concentrations ranged between 2,100mg/kg and 6,100mg/kg. Median concentrations of sulphur across all samples were 3,500mg/kg, while the standard deviation was 1,217mg/kg.
- Results for hydrocarbons in sediments of BTEXN (Benzene, Toluene, Ethylbenzene, Xylenes, and Naphthalene), Aliphatic and Aromatic Hydrocarbon, and Polyaromatic Hydrocarbon (PAH) concentrations were reported below the LOR at all sample sites.
- Total recoverable hydrocarbons (TRH) were detected in low concentrations at several sample sites, normalised TRH concentrations were reported below the ANZG (2018) DGV.

1.4.2 Ecological Components

1.4.2.1 Benthic Infauna

Biological sampling conducted during the EBS survey indicated the benthic infauna consist of 192 individuals from 62 identified taxa, with species diversity evenly distributed with no dominant species. The three most abundant species across all sites were the bristle worm Anthuridae, the Litocorsa sp1 and the Apseudidae.

In general, the abundance of benthic infauna around Chuditch-2 appraisal well location is low. Analysis of video transect of the location revealed the area around the Chuditch-2 well has low diversity.

1.4.2.2 Marine Fauna

During the EBS study no opportunistic marine megafauna observations were made by O2 Marine field staff or Offshore Unlimited vessel crew during survey operations.

The Timor Sea is known as Biodiversity Hotspot and is home to a wide variety of marine organisms such as fish, marine mammals like dolphins and whales, and sea turtles. These species are of ecological importance.

1.4.2.3 Corals

The Chuditch-2 proposed drilling site is not in the vicinity of any coral reef habitats, or sub-tidal shoal communities and so are not concerned by any potential impact from drilling activities.

1.4.2.4 Fisheries

The Chuditch-2 well is located in deep offshore waters, with no significant overlap with local or commercial fisheries. Coastal communities rely on small-scale fisheries, and fish near shore and therefore, the drilling operations will have limited impact.

1.4.2.5 Protected Areas and National Parks

The area comprises marine protected areas (MPAs) and national parks that provide protection to biodiversity and importance for eco-tourism. Since the project is near marine protected areas, proper project planning will be carried out in order not to harm species and their natural habitats. The Chuditch-2 project is proximal to MPAs and national parks and therefore crucial in biodiversity conservation.

The Oceanic Shoals Marine Park is located approximately 15km from the Chuditch field in Australian waters. Within this Marine Park, there is the Oceanic Marine reserve (National Park) which does not permit any fishing activities ('no take' zone). As the drilling location and marine parks are far apart with good industry practices and the EMP in place, there would be minimal impact on the marine parks.

1.4.3 Economic Components

Timor-Leste has a GDP of $3.16 billion (2022), projected to grow at 3.1% (2024) and 3.9% (2025). Key sectors of the economy are oil & gas, agriculture, fisheries, and tourism, with the oil and gas sector having been the most important component of the country's socio-economic landscape since the restoration of independence. The development of the Chuditch project has the potential to significantly and positively impact Timor-Leste and support national development – the Chuditch-2 appraisal well is a 'proof-of-concept for future development. Royalties and tax revenues go into the Petroleum Fund and contribute to the government's budget including funds for education, health and infrastructure. It also creates jobs in maritime logistics, engineering and maintenance and in supporting industries such as transportation, catering and accommodation. Offshore drilling also boosts the economy through increased demand for local businesses and services and a multiplier effect that increases household incomes and consumer spending. These are key to diversifying and strengthening Timor-Leste's economy and broader economic resilience.

1.4.3.1 Employment Sectors

According to Trading Economics (2023), the overall unemployment rate in Timor-Leste was 1.8% in 2022 and 2023, a relatively low figure compared to global averages. However, this does not account for the high levels of underemployment and informal labour, particularly in rural areas. Youth unemployment remains a major issue, with a rate of 12.31% among individuals aged 15–24 as of 2019. Many young people struggle to transition into formal employment due to limited opportunities and inadequate skills training.

1.4.3.2 Infrastructure Facilities

Timor-Leste has made progress in Infrastructure with a current road network of 6,041km (2,600km paved), with ongoing improvements. The recent development of the Tibar Bay Port, in operation since 2022, has improved trade efficiency. Additionally, ferry services operate between Dili and regions like Oecusse and Atauro, providing essential connectivity for passengers and vehicles.

The Nicolau Lobato International Airport serves limited international flights, requiring upgrades for future capacity. Other airports, such as those in Oecusse, Baucau, and Suai, primarily handle domestic flights and are less equipped for international traffic.

1.4.3.3 Tourism

Marine tourism has been identified as a potential economic growth area for Timor-Leste, particularly along the north and east coasts, and could deliver social and economic benefits through employment. Some ecotourism, including cultural tourism in coastal areas, in interaction with marine wildlife (dolphins, whales), fishing competitions and diving operators already exist, although further development of these industries is reliant on improved infrastructure and services. Activities to promote tourism include charter fishing, diving, snorkeling, whale mammal watching and visitations on luxury cruise boats to Timor-Leste. There are no known significant heritage or archaeological sites, shipwrecks or marine heritage sites in the vicinity of the survey/drilling area. There is no regular passenger vessel passing by the Chuditch Field.

1.4.4 Social Components

Timor-Leste has a population of about ~1.34 million (2023), with 60% under 25 years old. The rural areas account for about 70% of the population, while Dili, the capital city, is the primary urban hub. Whilst Timor-Leste has made progress in improving living standards, significant challenges still remain.

The Clean Water and Sanitation Census 2022 reported that most occupied housing units rely on public taps or public piped water (39.5%) as sources for drinking water. The others depend on rivers, streams, lakes, ponds and irrigation channels to get drinking water. Approximately 75% of households have access to improved drinking water sources, but only 46% have access to basic sanitation facilities.

As of 2024, Timor-Leste, has achieved a national electrification rate of 99%, according to *Eletricidade de Timor-Leste* (EDTL). This milestone reflects substantial government efforts to expand electricity access across the country. Electricity access at present is high 99% nationwide.

Public health in Timor-Leste has shown areas of progress. Life expectancy has also seen significant improvement.

Cultural Impact Assessment: There are no known significant marine heritage or archaeological sites, historical shipwrecks or marine heritage sites in the vicinity of the drilling activity. However, it is notable that the people of Timor-Leste still commonly carry out traditional rituals prior to conducting activities in the ocean.

1.5 Public Consultation

Stakeholder engagement is a crucial component of the EIA process. Consultations have been conducted with:

- Local Communities & Fishermen Groups to understand concerns regarding marine biodiversity and fisheries.
- Environmental NGOs & Academic Institutions to incorporate expert recommendations into the EMP.
- Government Regulatory Agencies to ensure adherence to all licensing requirements.

1.6 Potential Impacts and Mitigation Measures

Table 1-Summary of Potential Impacts and Mitigation Measure from Chuditch-2 Appraisal Drilling Project

Impact	Key Risk	Mitigation Measure
Seabed Disruption	Disturb benthic communities, affecting marine biodiversity	• Determine the rig leg positioning point based on the finding from seabed survey conducted before rig positioning. • Conduct seabed sediment and geotechnical sampling and pre-loading test to determine seabed stability. • Jack- up rig positioning/deployment to be carried out according to standard procedures to minimise disturbance to the seabed sediments.
Sediment Smothering	Burial and contamination of marine sediments, impacting benthic organisms	• Water-based mud (WBM) and Synthetic-based mud (SBM) drill cuttings will be discharged following dispersion modelling and in compliance with regulatory limits to minimize marine pollution. • Onboard separation of drilling muds for reuse as much as practicable to minimise drilling fluids discharge to the marine water. • Execute oil spill response plan to minimise spillage into marine water. • Installation of safety features such as automatic shutdown valves on the oily water separator to minimise risk of oily discharge to marine water.

Impact	Key Risk	Mitigation Measure
		• Filter fine cuttings from the drilling muds by shale shaker aboard the jack-up rig. • Use of high efficiency triple deck shale shakers to reduce the need for fluid dilution and minimizing the amount of residual fluid on drilled cuttings. • Cuttings discharged from shale shakers to contain a maximum of 9.2% SBM by wet weight. • Discharge of cuttings via a cutting caisson. • Testing of water-based drilling fluids physical properties prior final discharge to sea.
Water quality degradation	Increased turbidity and potential toxicity to marine life	• A copy of Material Safety Data Sheet (MSDS) should be made available and readily accessible as guidance for material handling and disposal. • A designated and proper storage area for chemical and hazardous materials must be provided on the rig. • The storage area should be sheltered and bunded to prevent rainwater collection and to contain spills. • Use less hazardous alternative chemicals, whenever possible. • Handling of chemicals and hydrocarbons should comply with strict procedures, including transfer and disposal procedures. • Retain records of chemical inventories. • Any spills and leaks of chemicals or hydrocarbon to deck should be cleaned immediately using absorbent materials. • All chemicals and hazardous wastes such as cleaning detergent, acids, solvents, toxic and medical wastes, contaminated mud, should be segregated and stored in clearly marked containers prior to disposal onshore.
Water quality degradation	Temporary nutrient enrichment, attracting marine fauna to the drilling site	• Appropriate screens should be fitted to the seawater intake to prevent ingestion of marine life, if safe and practical. • Drainage water collected from precipitation, sea spray or routine operations such as deck and equipment cleaning and fire drills, should be routed to a deck drainage system on the jack-up rig for direct discharge. • Contaminated water should be collected in preload tank for treatment using oily water separator as per MARPOL requirements.

Impact	Key Risk	Mitigation Measure
		• Water collected from the drill floor should be channelled into pre-load tank for treatment using the oily water separator before discharge into sea. IMO standard is 15 ppm. Reg 16(5) refers. MARPOL requires water discharged overboard after treatment by an oil/water separator to be <15 ppm. • Spill kits, absorbents and containers to be made available for clean-up of oil and grease contamination on deck. • The oil concentration in water discharge from the deck drainage should not exceed 15 mg/L at any one time or on an average of 15 mg/L over 24-hour period. • Bilge waters from machinery spaces on the jack-up rig should be routed to a separate drainage system on the deck, leading to the holding tank, contained and treated by oily water separator before discharge into the sea. The discharge should comply with the guidelines of oil concentration should not exceed 15mg/L. • Black water onboard should be channelled to the sewage treatment plant before discharge to sea.
Air Pollution: Greenhouse Gas Emissions	Increase the cumulative impact on air quality and climate change	• Consider safety issues on handling of volatile hydrocarbons during the recovery of test fluids which will be flared onsite. • Turning off engines when the machinery is not in use. • Periodic maintenance of machinery and equipment to ensure its efficiency. • Emission from fuel combustion machinery should be routed and emitted via adequate centralized exhaust system. • Selection of valves, flanges, fittings, seals, and filters should consider safety and suitability requirements as well as their capacity to reduce gas leaks and fugitive emissions. • Implement leak detection and repair programs. • Provision of adequate ventilation system in machinery and material storage room. • Good operational control and maintain high level of housekeeping.
Noise and Light pollution	Affecting marine biodiversity and	• Minimise unnecessary lights directed towards water and minimise the duration of appraisal drilling.

Impact	Key Risk	Mitigation Measure
	attracting marine fauna to the drilling site	• Deploy noise minimizer equipment.
Waste Pollution	Pollute marine habitats, affecting fisheries, and harming marine mammals, reptiles, and seabirds	• Food waste onboard should be treated using a macerator with the final disposal having grain size of less than 25mm diameter prior to disposal into the sea. • Disposal of food and sewage into the sea should be handled in accordance with the MARPOL requirements. • No plastic or plastic products, domestic wastes i.e. cans, glass, paper or other wastes are to be discharged overboard. • No maintenance wastes i.e. paint sweepings, rags, deck sweeping, oil soaks, machinery deposits, etc., to be disposed of overboard. • Wastes should be segregated according to comparable characteristics, stored in clearly marked skips for treatment and disposal onshore at approved disposal sites in Darwin, Australia. • Efforts should be made to eliminate, reduce or recycle wastes at all times. • Good housekeeping practices should be maintained on the deck. • Waste containers should be properly covered to prevent loss overboard. • A record should be maintained for solid waste to be disposed of onshore. • Oil soluble chemicals should be disposed of to the jack-up rig holding tank to be treated in oily water separator prior to discharge into sea.
Social Disturbance	Interference with shipping activities, ship disturbance in Timor Sea EEZ	• Inform and consult the relevant authorities on the shipping routes and schedules of the jack-up rig and the location of drilling sites. • Maintain ongoing communication with other mariners on the presence and progress of the drilling activity. • Employ radio system for real-time communication. • The rig should be lit during nighttime and during poor visibility. • Notify appropriate maritime authorities of the drilling works prior to work commencement onsite. • Consult and notify the Fisheries Department via ANP

Impact	Key Risk	Mitigation Measure
		and other vessel operators on the proposed appraisal drilling program. • Use findings from the seabed survey and sonar survey to assist in the positioning of the rig. • Ongoing communications with ANP throughout operations to prevent conflicts.
Oil Spills	Contaminating marine habitats, affecting fisheries, harming marine mammals, reptiles, and seabirds	• Installation of BOP system that can be closed rapidly in the event of an uncontrolled influx of formation fluids and which allows the well to be circulated safely by venting the gas at surface. • Periodical test and maintenance on the BOP during the operations. • Continuous monitoring of pressure reading during drilling to detect any abnormal pressures. • Maintaining wellbore pressure overbalance by effectively estimating formation fluid pressures and strength of subsurface formations. • Provision of emergency control plan, oil spill contingency plan and provision of emergency response training for the drill crews.
Leak from fittings and connections or leak from engines or machineries	Contaminating marine habitats, affecting fisheries, harming marine mammals, reptiles, and seabirds	• Install pressure low switch on flow lines. • Place of drip trays and sump under engines to contain leaks. • Oil collected in the drip trays and sump to be periodically transferred to the containment tank. • Provide adequate ventilation for the machinery room. • Installation of gas detection device in the event of detection of dangerous gas levels.
Spillage during refuelling	Contaminating marine habitats, affecting fisheries, harming marine mammals, reptiles, and seabirds	• Schedule refuelling activities during daylight hours and during calm weather and suitable sea-state conditions. • Refuel only at the discretion of the Vessel Master and OIM. • Conduct hose and couplings checked for integrity prior to refuelling. • Continuous visual monitoring of hoses, couplings and sea surface during refueling to monitor potential spill and leakage and continuous monitoring of fuel flow gauges.

Impact	Key Risk	Mitigation Measure
Diesel and Synthetic-based mud (SBM) spills	Oiling of marine life and coral reefs.	• Monitor and communicate with vessels approaching drilling site to reduce the risk of vessel collision. • Navigation lighting and watch aboard the rig. • Provision of radio contact between jack-up rig and supply vessel at all times. • Maintain updated weather forecast information at jack-up rig.
Introduction of invasive species	Introduction of non-native marine species	Clearing of biofouling on rig legs, if necessary, prior rig mobilization to and demobilization from well location.
Overall Spills	Oiling and contaminating marine habitats, affecting fisheries, harming marine mammals, reptiles, and seabirds	• Prepare Oil Spill Contingency Plan (OSCP). • Provision of spill clean-up kits on jack-up rig. • Design of drilling systems (i.e. well equipment, etc.) to reduce the risk of major un-contained spills. • Install valves to allow early shutdown or isolation in the event of emergency. • Provide adequate personnel training in oil spill prevention, containment and response. • Ensure spill response and containment equipment are deployed or available as necessary for response. • Conduct periodical inspection on chemical materials, hazardous wastes and oil storage area. • Stocks of absorbent materials on board/jack-up rig and standby vessel to be periodically checked for their adequacy and replenished as necessary prior to the commencement of appraisal drilling activities. • ANP should be informed of any oil spill incidents.

1.7 Conclusion and Recommendations

This EIA has been conducted to evaluate the potential environmental impacts arising from the proposed appraisal drilling program. Generally, the assessment has been conducted based on the appraisal drilling operational program and internationally acceptable drilling methods.

In conclusion, the assessment indicated that the existing environments within the project area are low in sensitivity. With the nature of the proposed appraisal drilling program, which is short term and with no permanent structures, the impacts are considered temporary and localised.

2. DETAILS OF THE PROJECT PROPONENT

2.1 Details of the Proponent

Operator: SundaGas Banda Unipessoal, Lda.

TIN: 2003222

Rua Presidente Nicolau Lobato

Timor Plaza, Level 3, Suite 337

Comoro, Dom Aleixo, Dili

Timor-Leste

Tel: +670 331 0847

Joint Venture Partner: TIMOR GAP Chuditch Unipessoal, Lda.

TIN: 2003016

Rua Presidente Nicolau Lobato

Timor Plaza, Level 3, Suite 301-314

Comoro, Dom Aleixo, Dili

Timor-Leste

Tel: +670 331 1422

2.2 Company Organization Structure

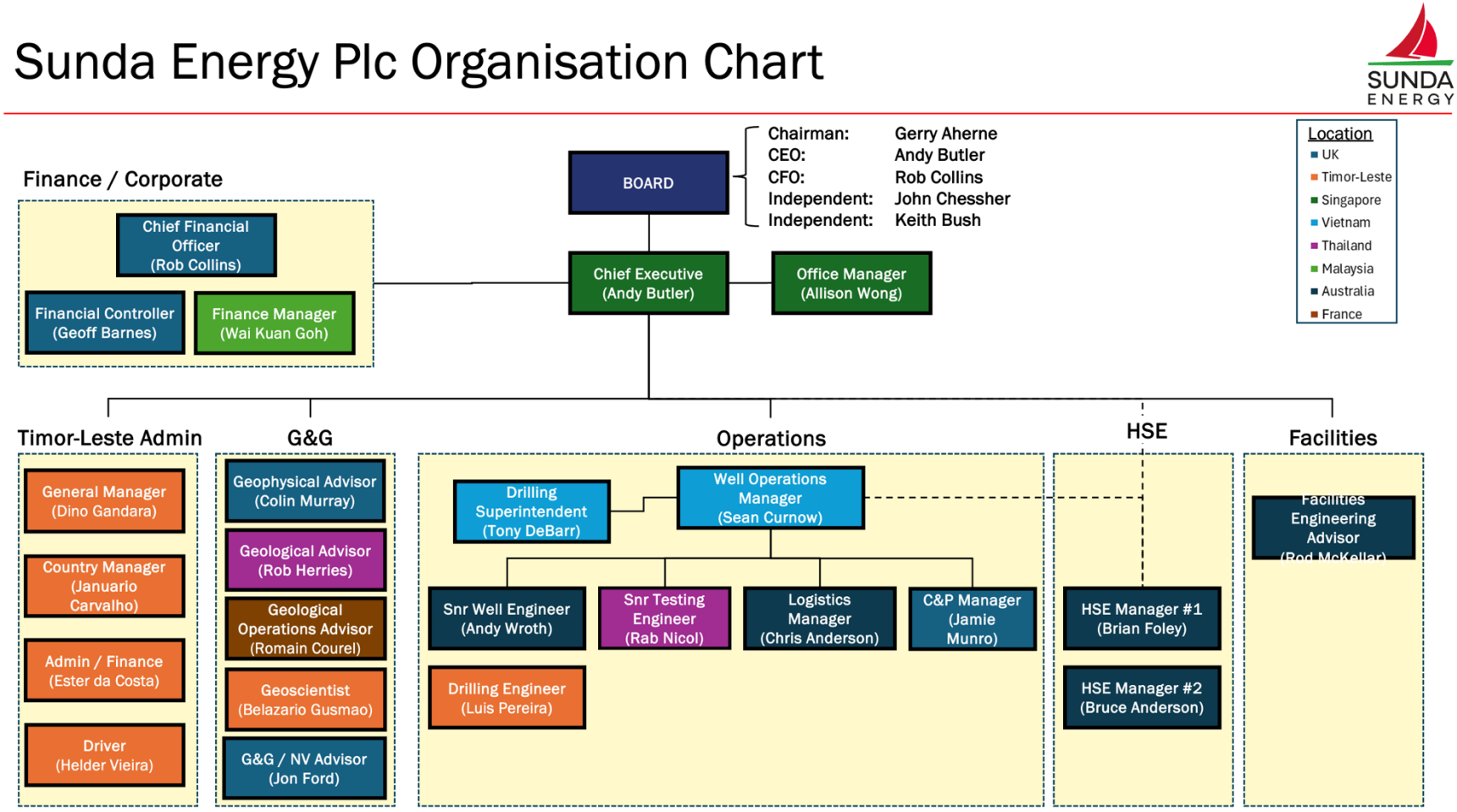


Figure 1-SGBU's Organizational Diagram

2.3 Contact Person

Dr. Andy Butler

Title : Managing Director

Email : andy.butler@sundagas.com

Mobile : +65 93845820

Sean Curnow

Title : Well Operations Manager

Email : sean.curnow@sundagas.com

Mobile : WhatsApp +44 7384 513212

Tony De Barr

Title : Drilling Superintendent

Email : tony.debarr@sundagas.com

Mobile : WhatsApp +84 129 713 9040

Brian Foley

Title : HSE Manager

Email : brian.foley@sundagas.com

Mobile : WhatsApp +84 093 272 0105

Bruce Anderson

Title : HSE Manager

Email : bruce.anderson@sundagas.com

Mobile : WhatsApp +61 439 039 066

Dino Gandara

Title : General Manager

Email : dino.gandara@sundagas.com

Mobile : +670 77626286

3. DETAILS OF EIA CONSULTANT

SundaGas Banda Unipessoal, Lda (SGBU) has engaged Halona Serena Lda, a Timor-Leste registered national consulting company, to carry out the Environmental Impact Assessment (EIA) study to produce the Environmental Impact Statement (EIS) and Environmental Management Plan (EMP) for the proposed project. Halona Serena has been providing services to domestic projects in Timor-Leste for approximately 3 years prior to commencing the subject EIA study.

Halona Serena is located in:

Rua Presidente Nicolao Lobato, Timor Plaza CBD 2, Room 402

Comoro, Dom Aleixo, Dili, Timor-Leste

Telephone: +670 7711 4459

Halona Serena Lda has a number of key and highly qualified personnel. The following is the list of the proposed key personnel to be involved in this project:

Awinash Dulip

EHS and ESG Adviser - with more than 35 years' experience in ESG, Environment management, EIA, EIS, EMP, environment monitoring in Oil & Gas and mining Sector. Worked with various governments, private companies, organizations, funding institutions and as Petroleum Regulator. Adviser-ed on Equator Principles (EPFIs) for managing social and environmental risks for project financing and major infrastructure projects funded through PPP, SVP, Development Financial Institutions (DFI), World Bank / ADB / IBRD / International Development Associations (IDA). Evaluated and monitored projects to IFC Performance Standards, pollution control abatement (PPAH) guidelines, and EHS guidelines for Onshore / Offshore Oil and Gas Development, ADB environmental safeguards & rapid environment assessment checklist. GHG, GRI on sustainability reporting, and CSR initiatives on social – economic reporting.

Pascoela Sequeira

Process Engineer experience for 8 years in evaluating the LNG process plant design for future Timor-Leste LNG plant and its supporting activities. Recently, alongside with Halona Serena and its team, successfully obtained Environmental Licensing for TGPB for the Pualaca Block Seismic Activity. She possesses a M.Sc. in Natural Gas Engineering and Management and B.Sc. in Chemical Engineering from University of Oklahoma.

Bertanizo Guro da Costa

Bertanizo has about 10 years of experience in conducting Research in various sectors, including environmental science, conservation, security and defence, legal pluralism, impartiality of formal justice system, education, domestic violence etc. He also has 5 years of experience in leadership role (e.g., Research coordinator, General coordinator of association etc.). He also has some expertise in Monitoring and Evaluation, research methods, statistics, data analysis, media and communications.

Maria Do Ceu Rosales

Maria is a graduate from the University of Western Australia, majoring in Environmental Science and Business Law. She is an Environmental Scientist with more than 7 years' experience predominantly in environmental assessment, management, and public procurement. She has led environmental studies on variety of environmental assessments and feasibility studies specifically for water resources management and has worked on a variety of projects from small-scale to large projects such as from established more than five water and sanitation projects to the rural communities and successfully completed marine environmental monitoring project for Tibar Port mega project.

Mario Marques Cabral

Has more than 20 years' experience as a marine biologist specialist. He has been working under Indonesian and Timor - Leste governments for marine departments. Also, Mario a candidate for Blue Planet Prize in 2022 (af:011785). The 31st Blue Planet Prize nomination process was organized by The Asahi Glass Foundation since the early of August 2021 under the supervision of Director, Commendation "Blue Planet Prize" (Toshihiro TANUMA, Ph.D.) in Tokyo-Japan. The Blue Planet Prize is an award presented to individuals or organizations from around the world in recognition of outstanding achievements in scientific research and its application that have helped provide solutions to global environmental problems.

Eurico Ediana da Costa

An experienced sociologist consultant with a demonstrated history of working around private sector development, research, decentralization, public policy, social-economic, community development, local government development, monitoring and evaluation, and gender mainstreaming. He possesses skills in M&E design, data analysis, research report,

project management, policy analysis, business analysis, project management, negotiation, problem-solving, capacity building, community consultation, and basic NVivo operation.

Joctan Dos Reis Lopes

Mr Lopes is a marine and coastal fisheries ecologist. He completed his MSc in Marine Biology at Bangor University (School of Ocean Sciences) and has been actively engaged in Small-Scale Fisheries for over 6 years. His work mainly focuses on developing data innovation and digital transformation to improve fisheries stock assessments, ecosystem interactions and aquatic food systems and enhance coastal resilience and livelihoods in Indo-Pacific Island countries. He is a published researcher with profound knowledge of ecosystem modelling and local and indigenous knowledge systems. Working alongside scientists, experts, governments, and fisheries practitioners, they have co-developed adaptive tools and context-specific practices that guide inclusive, well-informed, and sustainable marine resource management. He was one of the pioneers who developed PESKAS, an augmented real-time dashboard that collects catch data and provides fishing trends around Timor-Leste.

Tiago Gamboa

Geographer and HSE - Consultant with more than 25 years of experience in Environmental Management and Awareness, Environmental Impact Assessment, Environmental and Social Management Plan, Climate Change and Infrastructure Resilience, Water Resources, Urban Cleaning and Public Health, in the Public and Private Sectors, including international development cooperation in Timor-Leste.

4. PROJECT DESCRIPTION

4.1 Project identification

The appraisal well is known as Chuditch-2 and is located within the Chuditch field located in contract area PSC-TL-SO-19-16. This contract area is located in Timor Sea, in the northern Bonaparte Basin, Sahul Platform area. The Chuditch field is situated about 185km south of Timor-Leste's south coast and well will be located approximately 80km south-west of Greater Sunrise and 140km east-northeast of Bayu Undan. The location of Chuditch and the nearby fields are shown in Figure 2.

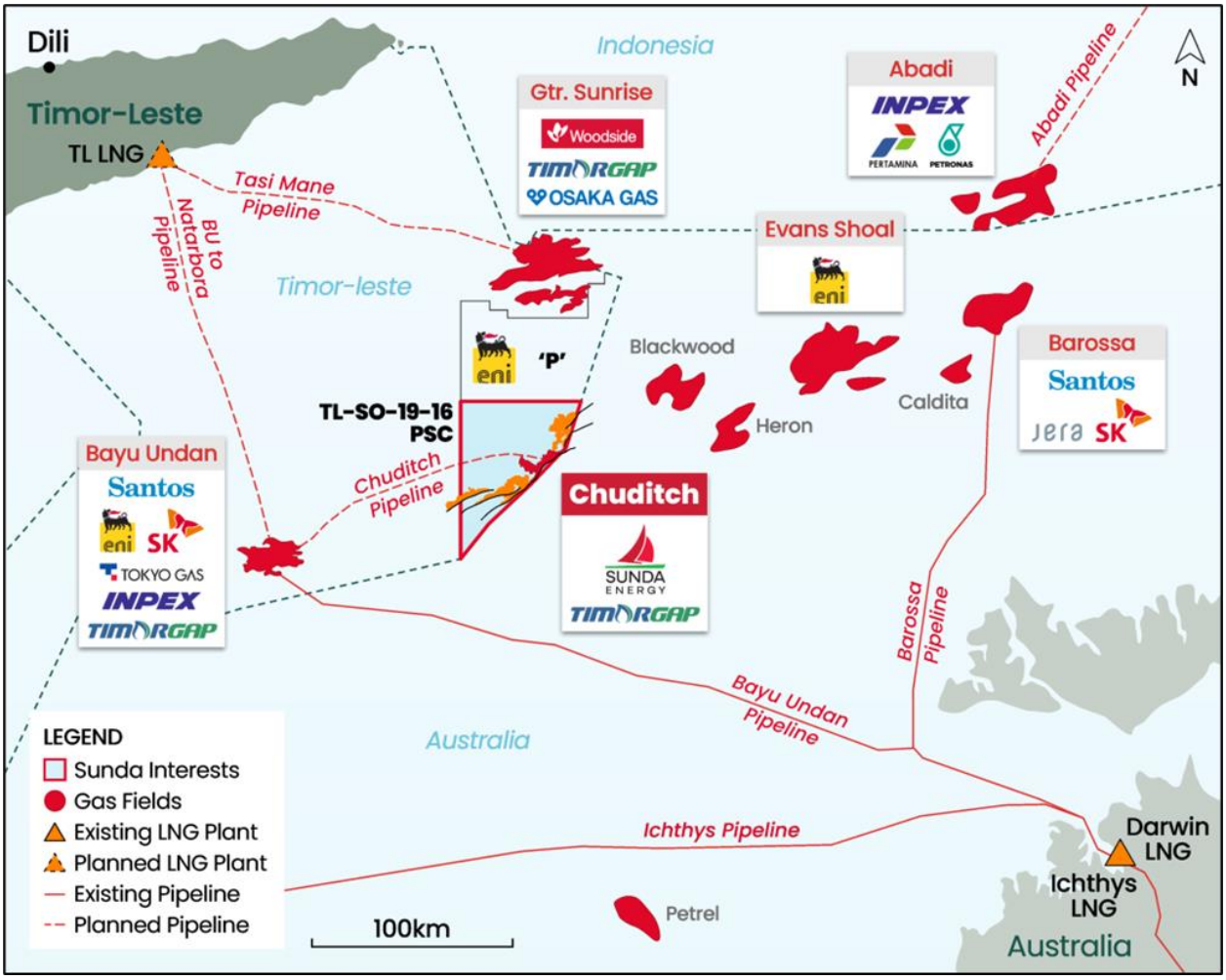


Figure 2-Location of Contract Area PSC-TL-SO-19-16/Chuditch and nearby fields.

4.2 Project Category

The project falls within the context of oil and gas appraisal drilling well operations. Chuditch-2 is an appraisal well drilled to evaluate the potential quantities of gas in the Chuditch field in Timor Sea for future hydrocarbon production. Such a project requires offshore drilling, environmental analysis, and geological data to make future operational and commercial decisions.

In November 2023, ANP approved the Project Document (PD) for drilling of Chuditch-2 on the PSC-TL-SO-19-16 and classified the project as a Category A activity, based on Decree Law No. 39/2022 1st Amendment of Decree Law No. 5/2011 on Environmental Licensing. SGBU subsequently submitted the Term of Reference (TOR) document which was approved in November 2024 by ANP and is the basis for preparing the Environmental Impact Statement (EIS) and Environmental Management Plan (EMP).

4.3 Nature, Size, and Location of the Project

4.3.1 Project Nature

Appraisal well drilling and well testing operations are conducted to assess the presence and viability of hydrocarbon resources in quantities that may support commercial extraction. These operations typically occur following the drilling of an exploration well, (Chuditch-1) and evaluation of all subsurface data including in this instance reinterpretation of existing seismic data. The purpose of drilling Chuditch-2 appraisal well is to confirm and assess commercial viability of the gas resource while minimizing environmental impact.

The objectives of the Chuditch-2 appraisal well will be to confirm the gas anticipated from the seismic mapping, better define gas resources associated with the Chuditch-1 discovery in the Plover sandstones reservoir and to perform a Drill Stem Test (DST) to evaluate the expected future production rates that may be achieved from the Chuditch field.

SGBU's team has designed procedures to cover the proposed drilling and well testing operations on the planned Chuditch-2 well, which is the second of two wells drilled on Block PSC TL-SO-19-16 in the Chuditch field.

The well will be drilled vertically using a jack-up drilling unit and is expected to penetrate the Plover sandstone formations in the interval from 2,880m to 3,010m TVDBRT. The well total depth is planned to be 3,010m TVDBRT.

The 12¼" hole will be drilled to a total depth of 3,010m TVDBRT through Plover sandstone formations, utilizing SBM. Wireline logging will be run in open hole to evaluate formation character and pressure.

If appraisal drilling is deemed successful based on the gas column and reservoirs encountered, a 9⅝" casing will be run and cemented in place and a DST will be conducted in 9⅝" cased hole to evaluate well productivity if sufficient gas shows are present in the sandstone formations.

Prior to any testing operations, the well will be displaced with sea water then circulated to $CaCl_2$ brine for the DST. The well will be perforated under-balanced with 4.50" HSD TCP guns, with 5" DST tools and a 4½" test string with a multi-rate test planned to evaluate the reservoir productivity. On completion of the DST, the well will be plugged and abandoned. Project details are summarized in Table 2.

Table 2-Summary of Chudicth-2 Project Details

Well Name	Chuditch-2			
Operator	SundaGas Banda Unipessoal, Lda			
Partnership	SundaGas Banda Unipessoal, Lda 70%, TIMOR GAP Chuditch Unipessoal, Lda 30%, subject to final approvals following the assignment of a 30% interest from SGBU to TIMOR GAP			
Project	Chuditch-2			
Well Type	Appraisal			
Well Trajectory	Vertical Profile			
State/Country	Timor-Leste			
Anticipated Hydrocarbon	Gas/Condensate			
Block	TL-SO-19-16 PSC			
Basin	North Bonaparte Basin			
Surface Location (Chuditch-2)	Lat :	10° 32′ 56.832″ S	X:	406,436
	Long :	128° 8′ 41.402″ E	Y:	8,833,746
Bottom hole Target (Chuditch-2)	Lat :	10° 32′ 56.832″ S	X:	406,436
	Long :	128° 8′ 41.402″ E	Y:	8,833,746
Geodetic Information	WGS84, UTM Zone 52S, CM 129°E			
Target Objective	Plover Formation			
Drilling Rig	Jack-up Rig			
Depth Reference	Mean Sea Level (MSL)			

Water Depth (MSL)	+/- 70m
Well TD	+/- 2,971 m TVD-MSL
Formation Temperature (Max)	~139°C (~282.2 °F) at TD
Formation Pressure	+/- 4400psi - Formations are predicted to be normally pressured from seabed down to Plover Formation
Target tolerance	50m at the Plover Formation target area
Hole Section	- 17½" hole for 13⅜" casing, planned setting at 1,650 m MDBRT. This is firm. Drilling fluid will be WBM (Seawater and Hi-vis) sweeps with returns to seabed. - 12¼" hole for 9⅝" casing, planned setting depth at 3,010 m MDBRT. This is firm. Drilling fluid will be SBM. Return to shale shaker before cuttings discharge to seabed.

4.3.2 Drilling Rig

The jack-up rig is equipped with comprehensive facilities, including accommodation, kitchen services, heating and power supply, sewage management, storage areas, medical and emergency response units, as well as secondary operations such as welding, painting, and machining.

To support logistics, a minimum of two Anchor Handling Tugs (AHT) will assist rig positioning after which two supply vessels will facilitate the transportation of equipment and supplies between the shore and the rig and support overall project activities offshore. Additionally, helicopter services will be deployed for crew transfers. Crew members will operate on a nominal 28-day rotation schedule, with approximately five crew change flights conducted per week to ensure operational efficiency and workforce sustainability.

A typical jack-up drilling rig and the main deck view are shown in Figure 3 and Figure 4, respectively. The rig will also provide dedicated storage for a variety of process chemicals and secondary materials. These include:

- Fuel Oil;
- Fresh (potable) water;
- Ballast (Seawater);
- Drilling water;
- Bulk mud and cement;
- Liquid mud;
- Dry process materials; and
- Pipe rack storage.

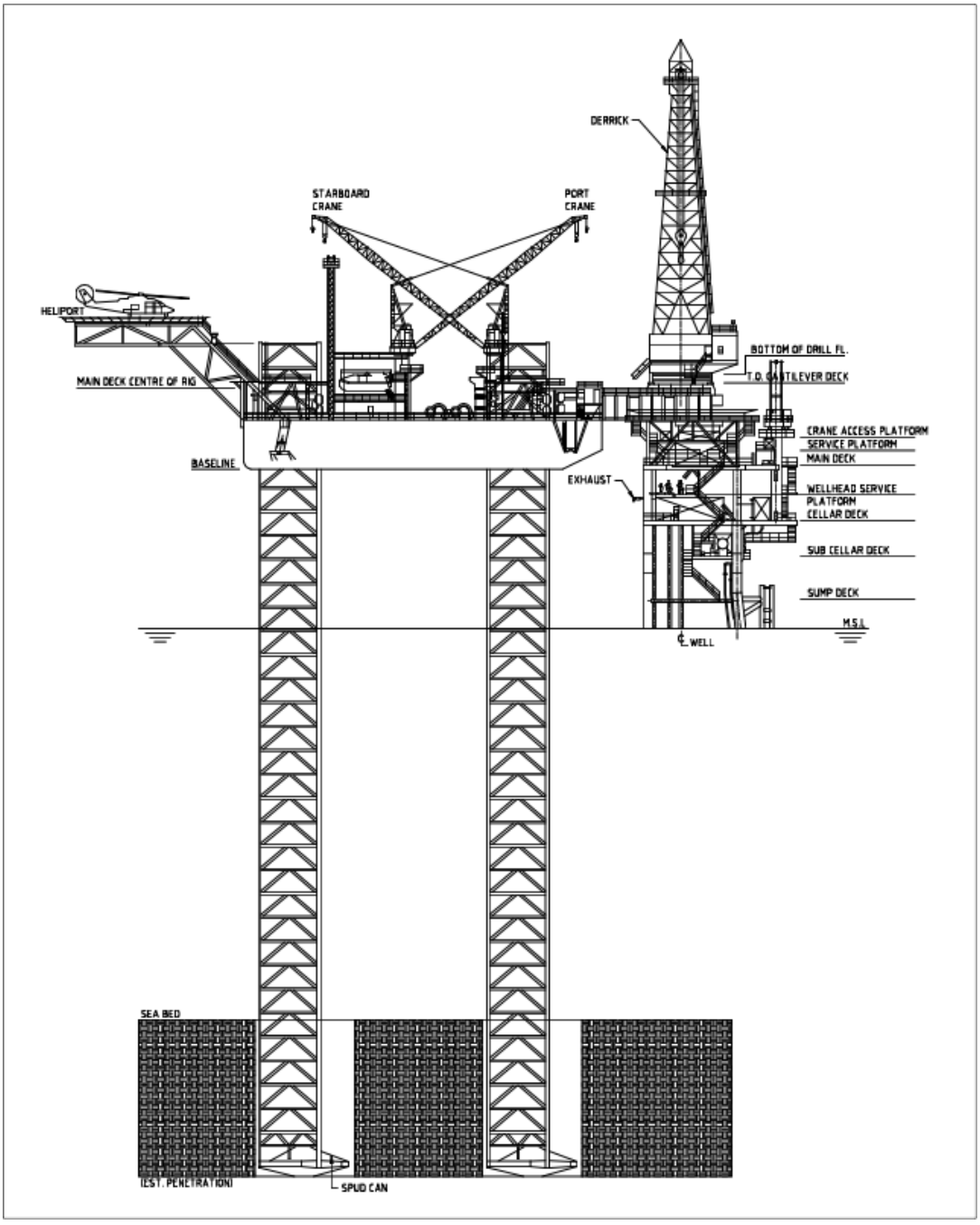


Figure 3-Illustration of Jack-Up Drilling Rig

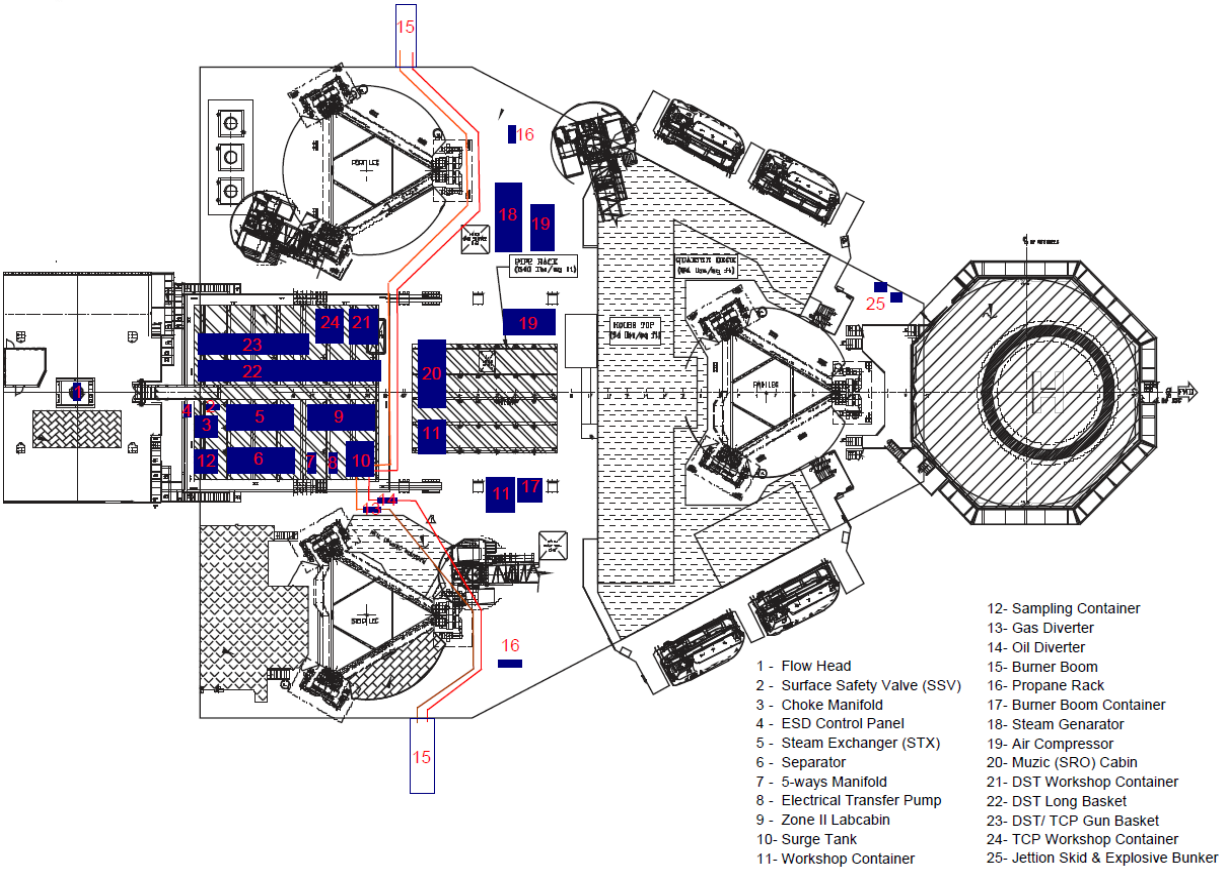


Figure 4-Typical view of Main Deck of a Jack-Up Drilling Rig

4.3.3 Project Activities and Drilling Program

The rig will be towed by one or two AHT's to the drill site. Upon arriving at the required location, the second AHT will be connected to the aft of the rig (port or starboard depending on metocean conditions at the time). The two AHT's will position the rig over the planned location and the legs will then be lowered to the seabed. Pre-loading of each leg will be performed to verify stability, and the rig will then be elevated to the desired height above the MSL.

Geotechnical and Geophysical (G&G) site surveys were completed in Q1 2024. The G&G site survey confirmed a suitable primary well location, and two additional locations should construction of a relief well be required. A temporary safety exclusion zone of 500m radius will be established around the rig location during the drilling operations always monitored by a 'standby' vessel.

Mobilization and the project logistics plan have not been finalized at this time. It is anticipated that most equipment will be mobilized via Darwin, Australia and personnel via either Darwin or Dili. Once the project logistical arrangements have been determined, suitable advice will be provided. Offshore supply vessels will be sourced through competitive tender. Helicopters required for personnel transfer and medivac will be sourced from aviation contractors capable of providing a safe and cost-effective service.

SGBU are planning to commence project activities and rig move in Q3 2025, based on the current rig schedule, the rig will be towed to location and positioned over the programmed well centre. Following soft pinning and ballasting operations, the rig will jack up to the approved air gap of approximately 15-18m above mean sea level and begin to rig up, take on extra personnel, equipment, fluids and chemicals in preparation for spudding the well.

Drilling activity of the Chuditch-2 well will target the Plover Formation to appraise the gas discovery encountered by Shell on the Chuditch-1 well. Its primary goals include confirming thicker gas pay in an upward direction from the original well toward its bounding fault and conducting a Drill Stem Test (DST) to assess the field's production potential.

The drilling process uses bits of different sizes to drill a series of concentric holes from the seabed to the planned well total depth. During drilling operations, a fluid known as drilling fluid or mud is circulated through the inside of the drill string to the bit and returns to the surface once the surface casing string has been installed. Drilling fluid performs several important functions including:

- Removal of drilled cuttings from the bottom of the well and transports cutting back to the surface, where they are then separated from the mud and discarded;
- Providing a hydrostatic column to control of natural formation pressures, preventing the uncontrolled flow of formation fluids into the borehole;
- Sealing permeable formations;
- Maintaining well stability;
- Cooling, lubricating and supporting the drill bit and assembly; and
- Transmitting hydraulic energy to tools and bit.

The drilling fluid is prepared by mixing mud additives and chemicals on site to the desired concentrations in seawater. During the drilling of the 12¼" section, SBM will circulate in a closed system being pumped down hole and recovered over shakers to separate SBM from

cuttings prior to the SBM being returned to the active circulation system. Both water-based mud (WBM) or synthetic-based mud (SBM) systems will be used for the drilling campaign. The SBM and WBM does not pose risk of contamination to subsurface formations.

4.3.3.1 Well Design

The objectives of an appraisal well in Chuditch contract area will be to confirm the gas anticipated from the seismic mapping, better define gas resources associated with the Chuditch-1 discovery and to perform a DST to evaluate the expected future production rates that may be achieved at Chuditch, and thus likely commercial viability. The program will include detailed engineering plans for the construction and operation of the well, including casing and cementing strategies, drilling fluid selection, and well control measures. Figure 5 shows well design for Chuditch-2.

The well will commence drilling 17½" hole, with fluid and cuttings returns taken to the seabed, once this hole section is drilled a casing string will be lowered into the hole and cemented. This provides a conduit for the return fluid during the drilling of the next section when SBM will be used. Wells are drilled in sections with predetermined decreasing sized drill bits used to drill a series of concentric holes from the seabed to the anticipated total well depth. After each section of the well is completed, the drill string is lifted and protective steel pipe or casing lowered into the well and cemented into place. The casing assists in maintaining well stability and helps to reduce fluid loss from the well bore into the surrounding rock formations.

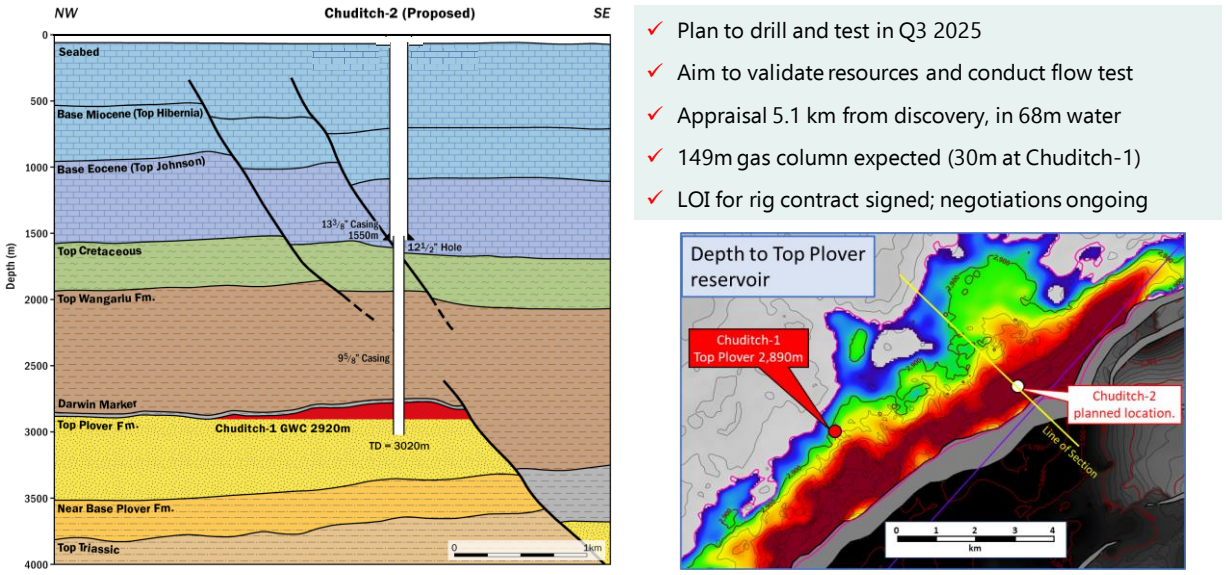


Figure 5-Well Design of Chuditch-2 Appraisal Well

4.3.3.2 Safety and Risk Management Procedures

Comprehensive safety protocols including design standards and equipment specification, peer review of designs and plans, formal risk assessment and HAZOP/HAZID conducted to identify and mitigate risks associated with offshore drilling activities, including emergency response plans. Well control procedures, tropical rotating storm planning, personnel training and equipment maintenance schedules. Strategies to mitigate risk and ensure the safety and success of the operation in an environmentally responsible manner.

4.3.3.3 Logistic and Supply Chain Management

Plans for the procurement and transportation of equipment, materials, and personnel to and from the offshore drilling site are in planning and are not finalized. SGBU will plan to ensure efficient operations. The Chuditch-2 well is located 310km SE of Dili and 340km NW from Darwin, with travel times of 1.5 hours for helicopters and 24 hours for supply vessels.

In addition to the mobilisation, drilling and testing operations, normal operations will include loading and offloading of cargo vessels as well as mud and chemical transfers. It is anticipated that equipment and chemicals required during the drilling program will be supplied to the rig by vessel from Darwin, these will be transferred to the rig by crane. Figure 6 shows potential support supply base locations and relevant distances.

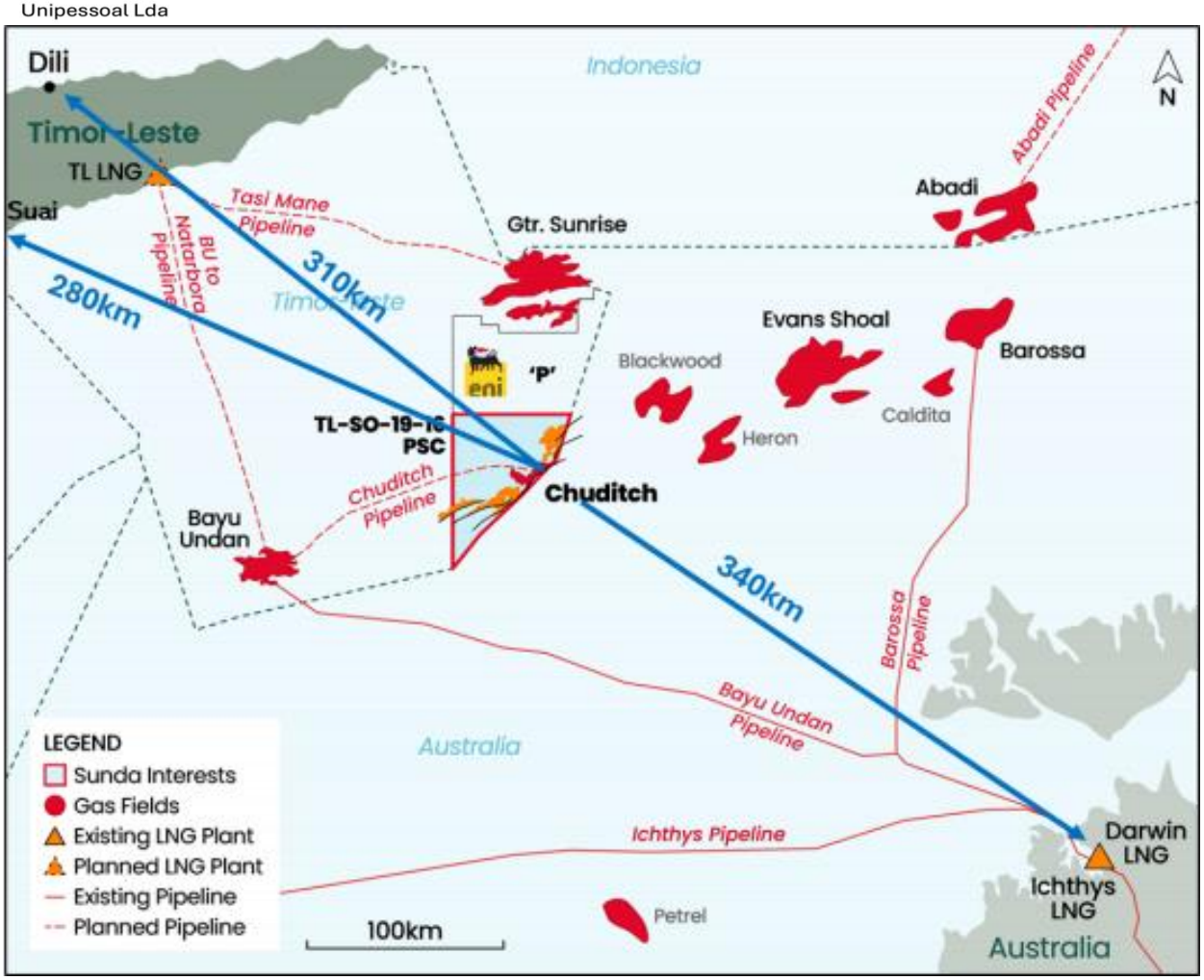


Figure 6-Support supply base location.

4.3.3.4 Drilling Resource Requirements

The majority of the resources required to drill the offshore appraisal well will be sourced from Australia.

The drilling rig will come self-contained with a highly trained and specialized workforce. Accommodation is supplied on the drilling rig, which will cater for two drilling shifts working on a 12-hour basis as well as daily operational and maintenance staff requirements. All other supporting drilling technical services will also be accommodated on-board.

4.3.3.5 Weather Monitoring and Contingency Plans

Monitoring systems to track weather conditions and develop contingency plans for adverse weather events, such as cyclones or tropical lows to ensure the safety of personnel and equipment. SGBU will contract with an appropriate weather forecasting company to provide

metocean data for the project. Contingency planning for weather events will be in accordance with drilling rig procedures.

4.3.3.6 Community Engagement

SGBU has engaged with local communities and stakeholders through the Public Consultation process, addressing concerns, and providing information about the location, intended drilling activities, duration and their potential impacts. The company will continue to reach out to all stakeholders through the period of preparation and operations.

4.3.3.7 Regulatory Compliance

Adherence to regulatory frameworks and obtaining necessary permits and approvals for offshore drilling activities in liaison with ANP, ensuring compliance with legal and environmental standards from the Government of Timor-Leste (GoTL), is a critical ongoing consideration in operations planning.

4.3.3.8 Drilling Schedule and Milestones

A timeline outlining the sequence of drilling operations, including key milestones and targets for completion of each stage of the drilling program is presented in Table 3.

4.3.3.9 Quality Assurance and Quality Control

Procedures will be in place maintain the quality and integrity of drilling operations, including regular inspections, testing, and monitoring of equipment and processes in accordance with SGBU-GEN-OPS-0026 Quality Assurance and Quality Control Standard.

4.3.3.10 Environmental Baseline Survey

An Environmental Baseline Survey (EBS) study was conducted in February 2025 which included water quality, sediment quality, and marine fauna. The EIA data obtained will inform the EIS, EMP and the monitoring program. The Scope of Environmental Baseline Study was approved by ANP in September 2024.

The primary objective of the EBS was to gather comprehensive baseline environmental data to enable effective post-drilling monitoring and impact assessment. The EBS identifies and documents baseline conditions for water quality, benthic habitats, and sediment characteristics near the well site to assess potential impacts from drilling activities.

Environmental quality monitoring is planned to be carried out during drilling to understand if any changes are seen in environmental parameters of water quality, benthic habitats, and sediment characteristics near the well site. The anticipated monitoring program during the drilling phase will include representative sampling of the EBS locations and associated testing.

4.3.4 Drill Plan Summary

The planned sequence of operations are as presented in the Estimated Project Execution Timeline Detailed Operation Breakdown for Appraisal Well drilling in Table 3.

The planned sequence of operations is:

- Mobilize the jack up rig to the Chuditch-2 well location. Position, pre-load and jack up to the planned air gap height above MSL. Rig and deploy a tensioning deck to cantilever structure. Skid out cantilever with tensioning deck and prepare for well spud.
- Drill 17½" hole combined with Measurement While Drilling (MWD / Logging While Drilling (LWD)) to planned section Total Depth (TD) using Sea Water, pumping 50bbls Hi-vis sweeps every half stand. At section TD, the hole will be circulated clean and displaced hole with 9.5ppg Potassium Chloride (KCL) / Polymer mud prior to running casing (wiper trip will be done if needed). The Remotely Operated Vehicle (ROV) will be launched for gas bubble and returns to seabed.
- Run 13⅜" casing with the compact housing (removal of all gate valves and blind off). Install casing clamp, activate the tensioning unit and land the casing string on the tensioning unit. Cement 13⅜" casing with full bore cement head. Disconnect compact housing running tool. Retrieve and layout the casing landing string. Install the gate valves on wellhead. Install Blow Out Preventer (BOP) adaptor/BOP and pressure test connection between BOP and compact housing (The full BOP test is conducted offline). Run wear bushing.
- Make up and Run In Hole (RIH) 12¼" Bottom Hole Assembly (BHA) to tag cement. Drill out the 13⅜" shoe track and 3m into new formation and conduct Formation Integrity Test (FIT).
- Drill 12¼" hole c/w MWD/LWD to a well TD using SBM with mud weight in the range of 9.5-9.8ppg (TBC). At the TD of well, circulate hole clean and Pull Out Of Hole (POOH) for logging (wiper trip to previous shoe will be done if needed).

- Wireline logging will be performed over the 12¼" open hole section as per program.
- RIH 12¼" wiper trip BHA, set a limitation of drag value, work through at any tight spots. At bottom, circulated hole clean. Flow check and POOH. (subject to hole condition during logging, this step may be skipped).
- A 9⅝" casing string will be run and cemented in place, top of cement at 100m above 13⅜" shoe. Disconnect 9⅝" casing hanger running tool and layout landing string. Run and install 9⅝" pack-off assembly inside the compact housing and pressure test.
- Run wellbore clean out tools. Clean and circulate well until clean including BOP ram caves. Displace well to packer fluid. POOH.
- Rig up wireline. Run Cement Bond Log (CBL) tools and POOH. Rig down wireline.
- Run guns and DST string. Set DST packer and pressure test. Fire the guns and perform well testing as per program.
- Kill the well and pull DST string.
- Set cement plugs, cut casing and recover wellhead/BOP for the well abandonment as per the program.
- Prepare for the rig move off location.
- Demobilize the rig.

Table 3-Estimated Project Execution Timeline Detailed Operation Breakdown for Appraisal Well drilling.

Operation	**Type**	**Number of Day**
Mobilization	Move	2.5
Pre-Loading / Rigging Up	Move	5.6
17½" Hole section	Drill	3.6
13⅜" Casing	Casing	1.9
18¾" BOP	BOP	1.0
12¼" Hole section	Drill	6.3
12¼" OH Logging	Log	3.8
9⅝" Casing	Casing	2.3
9⅝" CH Logging	Log	0.4
Well Clean-up	Clean-Up	1.4
Well Testing	Test	6.6

Operation	Type	Number of Day
Abandon Well	Plug	3.4
Rigging Down / Jack Down	Move	2.6
Demobilization	Move	2.6
Duration in Total	Approximation	**44.0**

4.3.4.1 Well Testing

The DST is intended to assess the commercial viability and potential of the hydrocarbon reservoir and specifically to determine the productive capacity, pressure, permeability, and extent of the reservoir. It is usual that in the event of the presence of sufficient quantities of hydrocarbons a temporary drill stem test string may be run and the well fluids flowed to the surface and processed using a surface well testing package that involves the hydrocarbons being flared to the atmosphere.

SGBU plans to perform a DST on the expected gas-charged Plover reservoir interval in the Chuditch-2 appraisal well. The DST is currently being designed and will be integrated into the overall well design by the SGBU well test engineer. The DST spread consists of two horizontal burner booms, one each to port and starboard of the jack-up rig, with dedicated gas lines complete with an ignition system to avoid 'dropout' during ignition for flaring gas and separate burner heads complete with ignition system for burning oil/condensate on each boom.

A standard three phase separator rated at 1,440psi, complete with oil, gas and water outlets capable of handling 75mmscf/d of gas and 6000bopd will be used. A full suite of 2.25" ID, 10K DST of downhole test tools including the following; retrievable packer, tubing test valve, safety valve, sample carrier, downhole shut in tester valve, single and multi cycle circulating valves and gauge carriers, which together provide isolation, tubing testing, downhole safety closure, downhole shut-ins for pressure build up, circulation, sampling and memory gauge conveyance.

The two DST gauge carriers will be run in the DST string with 2/4 x electronic pressure / temperature memory gauges in each carrier. All gauges will be linked to surface through the acoustic SRO system which gives real time bottom hole data read out throughout the DST. A full-bore DST sample carrier will also be deployed complete with bottom hole samplers. These samplers will be activated by applying a predetermined annulus pressure.

A subsurface, hydraulically controlled safety valve will be located in the rig BOP, where the BOP is close around a slick joint on the tool, allowing annulus pressure to be controlled via the rig pumps through the rig choke and kill lines, giving the required pressure for the downhole tool operations.

A thermal flow monitoring system will also be run along the length of the perforated interval, attached to the perforating guns and linked to the surface read out system, allowing real time monitoring of the flowing temperature profile of the perforations during DST operations.

Sufficient methanol will be brought onto the jack-up rig to mitigate the potential for hydrates formation.

In general, drill string testing entails taking measurements while flowing hydrocarbons to the surface and flaring and is a primary source of critical data for the reservoir model and the principal means by how reservoir engineers adjust reservoir model parameters, understand the reservoir and employ the knowledge gained to optimize future completion and development strategies.

During testing, operators measure formation pressure, characterize the formation fluids and reservoir and determine permeability and skin (damage to the formation incurred during drilling or other well operations). Data that indicate how the formation reacts to pressure increases and decreases during a test can also reveal critical information about the reservoir.

Once TD has been reached, the well logged and casing run and cemented, well testers will rig up the well test spread. A test string complete with tubing conveyed perforating guns and test packer will be run to a pre-determined depth and the packer set to isolate the zone to be tested. Guns are then fired and the formation perforated. The well is flowed at different rates through a choke valve and surface equipment which can be adjusted to control the flow rate precisely and provide positive well control.

Reservoir fluids produced to the surface are sent directly to a separator/surge tank, designed to function as storage/separation for produced liquids and gases until contaminants such as drilling fluids are eliminated, or at least minimized, from the flow stream.

On the Chuditch-2 well, three clean-ups flow are programmed and produced gases and fluids including produced water will be redirected to the test separator where bulk fluids are separated into oil (if present), condensate, gas and water. The separator also facilitates the separation of any debris, such as sand and other material from the flow.

During the DST, reservoir fluids are produced to the separator at varying rates according to a predetermined schedule. Apart from clean-up flows, well testing will include build up, drawdown and Absolute Open Flow (AOF). The AOF refers to the theoretical rate at the limit at which the well would flow if backpressure on the sand-face, or the borehole wall, were zero.

Note the maximum capacity of the well test choke and system is 50mmscf/d, which will limit the AOF to the maximum flow rate of the test spread. The minimised flaring plan anticipates a total flare time of approximately 31 hours. Table 4 below provides estimated flow periods and produced volumes.

Table 4-Provides estimated flow periods and produced volumes.

Period	Duration	Gas Rate	CGR	Gas Volume	Condensate Volume	Notes
	Hours	mmscf/d	Bbl/mmscf	mmscf	bbls	
Initial Flow	1	0	0	0	0	Shut it when gas to surface
Clean-Up Flow	8	40	4	13.33	53.33	
Multi Rate Flow #1	6	10	4	2.5	10	
Multi Rate Flow #2	6	25	4	6.25	25	
Multi Rate Flow #3	6	40	4	10	40	
Sampling Flow	2	10	4	0.83	3.33	
Maximum Flow	2	45	4	3.75	15	
Total Cumulative Volumes				36.67	146.67	

4.3.4.2 Cement Program

Cementing is an important aspect of drilling hydrocarbon wells as the cement is used for a variety of purposes including to secure and support casing strings, isolate zones for

production purposes and solve various hole problems. In the cementing process, cement is used with a variety of additives that act as accelerators/ retarders/ density adjusters and fluid loss additives, etc. An outline of the proposed cementing program is detailed in Table 5.

This illustrated cementing program is for technical guidance only. The final slurry designs for each casing size will be based on tests utilizing rig cement and water samples, recorded temperatures or other means of determining accurate bore hole pressures, temperatures, final shoe depths, callipered hole volumes, etc. The final cementing program will be issued to the rig prior to each individual cement job. The planned cementing programs are:

- 13⅜" casing will be cemented by full bore cement head c/w 12.5ppg Lead and 15.8ppg Tail slurry with Top Of Cement (TOC) at seabed.
- Spacer for WBM shall be pumped prior to releasing bottom plug to improve cement quality.
- 9⅝" casing will be cemented by full bore cement head c/w 12.5ppg Lead and 15.8ppg Tail slurry with TOC at 100m above 13⅜" shoe.
- As the static bottom hole temperature is more than 110°C, Class G cement blended with silica will be used. Also, as the isolation of reservoir interval is required, the tail slurry will include gas block additives and CO_2 anti corrosion additives.
- Spacer for SBM shall be pumped prior to releasing bottom plug to improve cement quality.

Table 5-Proposed cementing program

Hole Size (in)	Casing size (in)	Shoe depth (MD RT)	Slurry	Density (PPG)	TOC	Cement Type	Excess (%)	Comment
17½	13⅜	1,650	Lead and Tail	12.5/15.8	250m Tail. Lead: Sea bed	Class G	50	
12¼	9⅝	3,010	Lead and Tail	12.5/15.8	350m Tail. Lead: 100m above previous shoe	Class G blended	15	Including additives for gas tight and CO2 anti corrosion for Tail slurry
8½ Contingent	7	3,010	Single	15.8	Top of Liner hanger	Class G Blended	15	Same as tail slurry of 9⅝" casing.

4.3.4.3 Cement Plugs Program

Cement plugs are to be set for isolation of perforation zones in 9⅝" cased hole. A slurry at 15.8ppg shall be utilized for all plugs.

In general, the blended cement will be used for the deep plugs. However, this type of cement can be used for the shallow plugs to avoid loading new cement.

The maximum length of cement plugs to be set is 20m which minimize the risk of cementing-in the stinger due to the extra time taken to pull slowly out of the plug.

After plug is in place POOH slowly (30-50ft/min) and break connections carefully to avoid stripping plug. Any delays shall be avoided as usually the slurry is designed with a short pump time to improve strength development.

Prior to testing a plug (tagging or pressure testing), time should be allowed for it to develop sufficient compressive strength of at least 500psi.

4.3.4.4 Chemical Usage

Various drilling chemicals are added to the mud as it is mixed on the rig in order to provide specific properties for drilling at different depths, through various rock types and reactive clays. The density of the mud will be monitored and adjusted to match the downhole conditions and maintain a 150psi overbalance. The drilling mud is stored in dedicated tanks within the drilling unit.

A summary of the types and quantities of current estimate based upon use of WBM in 17½" hole section and SBM in 12¼" hole section the mud chemicals for consumption is provided in Table 6. The basic formulation for mud is lime, montmorillonite/bentonite, caustic soda, barite, sodium bicarbonate and cellulose polymer, none of which are considered toxic. Additives including a bactericide and hydrocarbon based defoamer are used in small amounts to prevent environmental impacts. Chemical use will be dependent on downhole conditions.

Table 6-Mud Chemical Consumption Summary

Item	25kg sack	MT
Mil-Bar		183
Mil-Gel		49
Calcium Chloride		45

Item	25kg sack	MT
Carbo-Gel	107	
Carbo-Trol 375	107	
Carbo-Vis	54	
Caustic Soda	20	
Ecco-Mul R	646	
Mil-Lime	374	
NX Clean Up+A		3 m^3
Saraline 185V		1784 bbls
Soda Ash	20	
Sodium Chloride	52	
Xan-Plex D	100	
RX-03X		3 m^3
Contingency		
LC Lube		
Chek-Loss		
Calcium Carbonate		
Sodium Bicarbonate		
Citric Acid		
Mil-Bio SEA 98		

4.3.4.5 Plug and Abandonment

Once the DST is completed, the well test equipment is rigged down and back loaded. Upon completion of drilling activities, the well will be plugged and abandoned where a bridge plug will be installed in conjunction with cement to ensure that higher density cement does not fall in the wellbore. The bridge plug would be set and cement pumped on top of the plug through the drill pipe and then the drill pipe withdrawn before the slurry thickens.

The well will be abandoned as per an approved abandonment program which will detail depth and length of cement plugs and requirement for pressure or weight testing of same. Finally, the casing is cut below the mudline and pulled to surface

Once the well is secured for abandonment and all equipment retrieved, the rig will be prepared for moving to the next location. This is a reverse of the installation process with

the rig being jacked down and legs freed. The rig is then pulled off the location and moved to the next site by one or two anchor handling vessels.

4.3.4.6 Post Well Survey

The ROV will be deployed and conduct a post well survey in the vicinity of the well to ensure no dropped equipment or other object is left on the seabed. Video transects are downloaded to a separate storage device and made available for use in post project environmental monitoring if required and/or used in environmental monitoring reporting.

4.3.4.7 Rig Down and Rig Move

The jack-up then down rigs equipment, jacks down to the water and retracts the legs in a pre-planned sequence. The tow vessel takes tension on the bridle and moves the jack-up rig off location.

4.3.4.8 Well Control Event

The Plover is a normally pressured formation. In the event of encountering shallow gas whilst drilling top hole, drilling into an unknown over pressured zone or equipment failure the jack-up rig may encounter a well kick or loss of control resulting in either partial loss of down hole fluids or in a worst-case scenario total evacuation of the hydrostatic mud column and well bore fluids migrating to the surface. Risks are considered in jack-up rig and equipment selection, and all scenarios are considered in well design and drill pipe, casing selection and BOP specification. The well is prognosed to be an almost dry gas well with a small fraction of condensates (<4%) and approximately 18% CO_2. Modelling indicates a condensate release will remain offshore and disappear rapidly through a combination of evaporation, bioremediation and entrainment in the water column. The weathered residues of the condensate will comprise mostly straight chain normal alkane (n-alkane) commonly called "paraffin wax". The paraffin wax residues in the condensate will always remain afloat as the product spreads out and thins while it weathers at sea. As the residual condensate increases in viscosity until the pour point is higher than the surrounding seawater, it will begin to form thin clear sheets and white crystalline pancakes. These waxy sheets will then break up into small white waxy flakes due to the action of the waves and wind over time.

Condensate hydrocarbons which cause most of the aquatic toxicity are usually smaller aromatic and soluble components (one and two ring aromatics) or poly aromatic hydrocarbons. The condensate is prognosed to be 82% by mass of volatile and semi volatile

compounds, which are the compounds considered toxic. However, these compounds will evaporate rapidly on the sea-surface. Hence, the weathered residues of the condensate are considered to not have these components present at levels that would pose a significant aquatic toxicity risk.

The dry gas including CO_2 will rise to the surface and combine with atmospheric gases in the event of a subsea release and will not remain entrained in the water column.

4.3.4.9 Side Track

Should the drill string become stuck in hole and efforts to free it are unsuccessful, it may be necessary to use either a shaped explosive charge or a specialised mechanical cutter to separate drill pipe above the stuck pipe. After recovering remaining drill pipe above the stuck pipe, a contingency, which will be considered in the event of loss of the drill string, will be to run back in hole to a planned depth and kick off a side track and use directional drilling techniques to continue drilling to target. There is no additional risk to the environment in a contingency side track.

4.3.4.10 Unplanned Anchoring

Should a supply vessel experience a loss of power or propulsion and be close to the rig on the upwind side, it may be necessary to drop an anchor to halt drift. Vessels of the size to be employed for the project will have enough anchor chain and rode to allow a 3 to 1 scope. In water depths of ~68m the majority of the chain will remain off the seabed ensuring a minimized drag zone and impact to the seabed. The anchor will, under tension, bury to an unknown depth in the seabed, if little or no dragging occurs, impact to the seabed will be of minimal disturbance and the immediate locality will recover rapidly with no meaningful effect on the infauna or benthic population.

4.3.4.11 Diesel/NADF/SBM Spill

Spill modelling for realistic unplanned discharges to the environment show that in all modelled scenarios, diesel and Non-Aqueous Drilling Fluid (NADF) spills remain well offshore with a diesel spill remaining at surface level and weathering/evaporating within 5 days to a level where it is no longer visible to the naked eye. Modelled NADF similarly lost approximately 45% of total volume within a 5-day period. NADF at ~0.8 Specific Gravity (SG) is significantly lighter than sea water and thus remains at surface level where

wind/wave/current and sun combined with high levels of biodegradation of the Saraline 185V cause the spill to rapidly disperse within a 5-day period (MuTek, 2024).

4.3.5 Rig Specification

SGBU is currently in negotiation with a specific drilling contractor for a jack-up drilling rig for the Chuditch-2 appraisal well program. However, should another rig be contracted, the rig design and specification level will be similar to the one under negotiation. Details of the intended rig are provided as typical of the rig to be contracted. The jack-up rig is supported by three vertical legs, with spud cans designed to contact and penetrate the seabed and provide stability and support for the rig. Impact to receptors from spud can interaction with the seabed will be transient and minimal in impact.

Drilling rig equipment is as follows:

4.3.5.1 Mud Pump

There will be four National Oilwell model 14-P-220 Triplex each with a continuous 2,200HP rating capable of operating at a maximum working pressure of 7,500Psi or of similar specification depending upon the rig contracted. Extract from rig IADC equipment list presented in Table 7.

Table 7-High Pressure Mud System

System working pressure	Psi	7500
System test pressure	Psi	7500
Mud Pumps		
Quantity		4
Make		National Oilwell
Model		14-P-220
Type (Triplex/Duplex)		Triplex
Mud Pump drive motors/pump		2
Motor type		General Electric 752 Hi Torque Shunt Wound Motors
Continuous Power Rating	Hp	2200
Fluid End Type		Plungers
Maximum Working Pressure	Psi	7500
Test Pressure	Psi	7500

Pump stroke centre type		Rigserv
Supercharging pump type		Halco Centrifugal Pump
Driven by Motor of Power	Hp	100
Discharge/suction line ID	In	5-1/8in. / 5-1/8in.
Mud Pump Pulsation dampener type		Hydril K20-7500 KPD
Reset Relief Valve		Taylor Valve – Rupture Pin
Max. Pump Speed	SPM	90
Working flowrate per pump		1155gpm @ 2660 psi – 514gpm @ 6000 psi
Available liner sizes		5-9''
Liner size # 1	In	5½''
Pressure rating	Psi	7500
Working flowrate (volume per stroke)	Bbls/stk	0.098

4.3.5.2 Mud Tanks

The planned drilling rig is fitted with 10 storage Mud tanks with a total capacity of 5,095Bbl. Table 8 below, extract from the rig IADC equipment list, detailing storage capacity.

Table 8-Summary of Mud Tanks

Gumbo Trap	Yes/no	Yes
Sand trap tank, usable volume	Bbl	230
Degasser tank, usable volume	Bbl	See total capacity below
Agitated	Yes/No	No
Desander Tank, usable volume	Bbl	See total capacity below
Agitated	Yes/No	No
Mud Cleaner tank, usable volume	Bbl	See total capacity below
Agitated	Yes/No	No
Centrifugal tank, usable volume	Bbl	See total capacity below
Agitated	Yes/No	No
Other tank, usable volume	Bbl	See total capacity below
Agitated	Yes/No	No
Total Usable Capacity	Bbl	418
Mud Tanks		
Quantity		10

Total capacity (usable volume)	Bbl	5096
Usable capacity # 1	Bbl	745
Type (Active/Reverse)		Active
Height	Ft	15
Mixer	Yes/no	Yes
Mud guns	Yes/no	No
Discharge from flowline	Yes/no	Yes
Usable capacity # 2	Bbl	447
Type (Active/Reverse)		Active
Height	Ft	15
Mixer	Yes/no	Yes
Mud guns	Yes/no	No
Discharge from flowline	Yes/no	Yes
Usable capacity # 3	Bbl	198
Type (Active/Reverse)		Active
Height	Ft	15
Mixer	Yes/no	Yes
Mud guns	Yes/no	No
Discharge from flowline	Yes/no	Yes
Usable capacity # 4	Bbl	198
Type (Active/Reverse)		Active
Height	Ft	15
Mixer	Yes/no	Yes
Mud guns	Yes/no	No
Discharge from flowline	Yes/no	Yes
Usable capacity # 5	Bbl	447
Type (Active/Reverse)		Active
Height	Ft	15
Mixer	Yes/no	Yes
Mud guns	Yes/no	No
Discharge from flowline	Yes/no	Yes
Usable capacity # 6	Bbl	745

Type (Active/Reverse)		Active
Height	Ft	15
Mixer	Yes/no	Yes
Mud guns	Yes/no	No
Discharge from flowline	Yes/no	Yes

4.3.5.3 Shale Shakers

Four AX-1 Triple deck shakers are fitted to the drilling rig. These shale shakers can be operated in parallel or series mode. The screen size will be selected at the minimum screen mesh size practical to minimize OOC (Oil-on Cuttings). OOC will be monitored closely whilst drilling / circulating operations are ongoing. Samples from all the solids control discharges will be taken, analysed and reported daily when drilling the 12¼" section. Table 9 extract from rig IADC equipment list – Shale Shakers.

Table 9-Shale Shakers

Primary	
Quantity	4
Make	Axlom (NOV)
Model	AX-1 Shale Shaker
Type	Triple Deck

4.3.5.4 Blow Out Preventer (BOP)

The high-pressure BOP consists of two units (i.e., one double and one single), all appropriate components are H_2S rated. Both are 18¾ inch Type "U", and each has a working pressure of 10,000psi. Table 10 extract from rig IADC equipment list.

Table 10-Ram Type Preventer

Quantity	1
Make	Cameron
Model	Type "U"
Type	Double
Quantity	1
Make	Cameron
Typs	Single
Size	18¾''

Working Pressure	10,000psi
Annular Preventer	
Quantity	1
Make	Shaffer
Size	18¾''
Working Pressure	5,000psi

4.3.5.5 Engine and Generators Unit

The rig power generation system consists of 5 Caterpillar Model 3608 Diesel fuelled internal combustion engines coupled to hi output alternators. The generation plant is situated within the internal levels of the rig structure where noise is negated by several compartments of varying size between the noise source and the exterior. The exhaust stacks emerge from the upper level of the rig structure and hot exhaust gases are exhausted via tubular exhaust stacks high above workspaces in open air.

Each of the five engines driving generator packs have a maximum continuous power of 3,395hp at 900rpm. Each AC alternator generates a continuous rating of 2,400kW at 600 volts and 900rpm.

4.3.5.6 Solids Treatment Equipment

In addition to the rig supplied shale shakers SGBU will install a centrifuge to further reduce drilled solids in the drilling fluid minimizing the amount of dilution required. As a function of the approval to employ the NADF Saraline 185 V, SGBU has committed to the discharge of 9.2% NADF by wet weight of cuttings or less for SBM contaminated drill cuttings averaged over the usage of SBM during drilling.

4.3.5.7 Drilling Fluid

This project will use both Water Based Mud (WBM) in the 17½" section and Synthetic Based Mud (SBM) when drilling the 12¼" section through technically challenging formations. The chemical selection and assessment process used for the appraisal drilling and well testing are in accordance with good oilfield practice, SGBU have a process for selection and evaluation and use of chemical substances including drilling fluid and cement additives to ensure the well integrity, formation compatibility, operational efficiency, and environmental safety throughout Chuditch-2 drilling operations.

Chemicals are chosen on the basis of efficiency in performance and environmental acceptance criteria. Wherever possible chemicals are chosen which are Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Chemical Hazard Assessment and Risk Management (CHARM) Gold standard or CEFAS Offshore Chemical Notification Scheme (OCNS) E rated as least harmful to the environment and considered to be As Low As Reasonably Practicable (ALARP). Should a specified chemical not meet ALARP acceptability criteria, SGBU may conduct a chemical-specific hazard assessment of the candidate chemical to determine its suitability for use. The Hazard assessment process will be documented and conducted in accordance with the Hazard Assessment process.

If a chemical is rated as equivalent to D through E, or color banded as Silver or Gold the chemical shall be acceptable for use.

If a chemical is rated A, B, or C or color banded purple, orange, blue or white, use of the chemical must be justified. When a candidate chemical is proposed for use in a drilling program and it is rated A, B or C or has color banding of Purple, Orange, Blue or white in accordance with CEFAS CHARM or OCNS rating methodology, alternatives will be considered to eliminate or substitute the chemical.

If the chemical cannot be suitably eliminated or substituted and SGBU has determined the candidate chemical poses the lowest environmental hazard and is necessary to safe and efficient operation, SGBU will develop a written submission and justification which demonstrates to the ANP on the use and discharge of the candidate chemical will meet regulatory obligations and/or propose controls/mitigations must be in place in order to do so.

If the justification is acceptable to the regulator, the chemical is accepted for use. Should the justification not be sufficient for approval by the regulator, the chemical shall be rejected.

Once a chemical has been chosen, the quantity used, and its ultimate fate will be tracked. Its 'ultimate fate' could include such aspects as storage, discharge overboard, waste brought to shore, injection downhole or being left in the well, or it could be consumed in a chemical reaction. This 'material balance' will be calculated, where reasonably practical, using conservative assumptions if precise information is not readily available. (i.e., assuming any material otherwise not accounted for is discharged).

Water-Based Mud

Water-based mud (WBM) will be used to drill the 17½" hole from seabed to the 13⅜" casing setting depth (1,650m MDBRT) using seawater and hi-viscosity sweeps. The water-based mud volume to be discharged to the environment is approximately 1,193m^3.

The WBM will be seawater and high viscosity sweeps which contains bentonite, caustic soda, soda ash, drill water and Xan-plex D. The mix has a specific gravity of 1 to 1.14 and will be discharged at seabed.

Synthetic Based Mud (SBM)

The NADF to be used in the construction of the 12¼" section of the Chuditch-2 well will be Saraline 185V, an OCNS "E" rated substance. Saraline 185V was the subject of an application for use by SGBU granted by ANP on 19th July 2024. ANP reference ANP/HSE/S/24/106 - Approved for Offshore Discharge. The SBM volume to be discharged to the environment as oil retained on cuttings is approximately 99m^3 (20% over gauge hole).

Saraline 185 V is an 'E' rated (Lowest Environmental Hazard) product under the OCNS (Offshore Chemical Notification Scheme) and approved for offshore discharge in more than 40 countries due to its extremely favourable environmental profile. Table 11- Saraline 185V Properties.

Table 11-Saraline 185V Properties

Property	Test Protocol	Results
Biodegradation		
Aerobic (Freshwater)	OECD 301F	75% after 28d (Readily biodegradable
Aerobic (Marine Water)	OECD 306	64% after 28d (Readily biodegradable)
Aerobic (Soil)	OECD 307	Half-life (DT50) = 21d (Based on 1000mg/kg initial dose)
Water Column Toxicity		
Acartia Tonsa	PARCOM, ISO 14569	48h EL50:>1,000mg/L (non-toxic)
Skeletonema costatum	OSPAR/PARCOM	72h EL50:>1,000mg/L (non-toxic)
Mysidopsia Bahia	US-EPA 2001 40 CFR 435	96h lC50:>1,000,000ppm of 10% SPP (non-toxic)
Pagrus Auratus	US-EPA 2003	7d lC50:>100,000mg/L (non-toxic)
Daphina Magna	OECD 202	48h EL50:>1,000mg/L (non-toxic)
Brachydania Reria	OECD 203	96h LL50:>1,000mg/L (non-toxic)
Sediment Organism Toxicity		
Caraphium Valutator	PARCOM Protocol 1995 (A)	10d lC50>20,000mg/kg (wet basis)
Bioaccumulation Potential		
Octanol-water partition	OECD 117	Log Kaw>6.5 (not bioaccumulative due

Property	Test Protocol	Results
coefficient		to poor bioavailability)

Low Toxicity

Its linear structures result in low toxicity to fish, invertebrates and algae in the water column and sedimentary toxicity testing. Notably, Saraline 185 V does not bioaccumulate in marine organisms.

High Biodegradability

Saraline 185V is readily biodegradable in both marine water (OECD 306 test) and fresh water (OECD 301F test). Saraline demonstrated excellent bioremediation properties even considering onshore land farming methods as proven in studies in Bangladesh, China and New Zealand (Sanzone et al., 2016).

SBM consisting of Saraline 185V drill water, Carbomul HT, Deltaver, Carbogel, Deltalift, Carbotrol 375, lime, calcium chloride and barite will be used from the depth of 1,650m, in the 12¼" hole until TD is reached at approximately 3,010m TVDBRT. Whilst in use The SBM will be circulated in a closed system and returned over the shale shakers. The cuttings will be treated to a maximum of 9.2% wet weight, oil on cuttings before discharge overboard to the seabed from a discharge depth of 5m below MSL. Note: Only cuttings will be discharged. SBM will be separated from cuttings as the cuttings and mud move across the shaker screens, or through the centrifuge, and mud will be returned to the active system for re-use.

At the conclusion of the drilling project the total remaining volume of SBM will be returned to the service provider's onshore storage facility prior to rig release. The SBM will then be recycled, reused, or resold. Table 12 provides physical properties of Saraline 185V and Table 13 provides a comparison of Saraline 185V to Diesel and LTMO.

Table 12-Saraline 185V Physical Property

Typical Properties	Saraline 185V	Remarks
Product Type	Synthetic Paraffin	Higher purity, consistent quality
Density @ 15°C, kg/m3	778	Under/ near balanced drilling
Flash Point, °C	85 - 93	Improved worker and assets safety
Viscosity @ 40°C, cSt	2.6 – 2.8	Higher drilling efficiency
Pour Point, °C	-30	Better cold flow properties
Aniline Point, °C	95	Enhanced elastomer compatibility, less non-productive time.

Table 13-Comparison of Saraline 185V to Diesel and LTMO

Property	Diesel	LTMO*	Saraline 185V	GTL Advantages
Flash point, °C	56 - 75	70 - 115	85	Improved safety
Aromatics, ppm wt Total PAHs ppm (Grimmer series)	$3x10^5$ - $6x10^5$ 680 - 3000 (NA)	50 - 1,000NA(NA)	200 ~0.002 (<0.2 ppb)	Lower toxicity, Improved worker safety
BTEX, ppm	400 - 2,500	Non-detect	Non-detect	Lower toxicity, Improved worker safety
Density at 15°C, kg/m³	800 - 865	804 - 814	790	Lower mud density
Viscosity, cSt, 40 °C	1.9 - 4.1	1.68 - 3.6	<2.8	Fast, consistent drilling
Pour point, °C	−12	−27 - -20	−24	Good performance in harsh environments
Aniline point, °C	61	72 - 91	94	Improved elastomer compatibility

4.3.6 Drilling Waste Management

The various waste streams that are likely to be generated from the jack-up Drilling Rig will include:

- Drill cuttings mainly comprised of shale, limestone, sand and clay;
- Waste WBM and SBM from drilling activity;
- Drilling wastewater as a result of washing the drilling cuttings. Silt and sand will contain chemical ingredients from the drilling fluid and needs treatment before discharge;
- Chemical sludge generated from the wastewater treatment;
- Hydrocarbons such as waste oil from oil changes and leakages from equipment. Used oil is designated as hazardous;
- Non-hazardous solid waste such as paper wood and plastics;
- Hazardous waste including hazardous ingredients such as fluid or testing chemicals and containers previously holding hazardous material; and
- Biodegradable waste such as food scraps.
- Wastewater will be treated by the rig waste disposal system and discharged into the sea after treatment. Excess water-based drilling mud will be pumped straight into the sea as the chemicals used are biodegradable, non-toxic and environmentally acceptable. In the case of hazardous drilling wastes, these will be collected, stored and transported ashore for disposal by an Approved waste disposal company.

- Used fuels and chemicals will be stored in containers in areas lined with impervious floors and surrounded by containment bunds on the rig. Recyclable material will intermittently be transported to the supply vessel and materials include used filters, paper, cardboard, and plastic.
- Oily water will be treated by oily water separators and the overboard discharge from the oily water separators will be monitored by an oil-in-water monitor. By design the overboard pump will automatically shut down if the concentration of oil in discharged water exceeds 15 part per million (ppm) oil in water.
- Sewage treatment unit with vacuum collection system is installed on the rig.

SGBU is still in process of contracting for Waste management services for return of waste streams from the drilling operation.

The rig contractor conforms to MARPOL and other international standards for waste segregation and management. Figure 7 below provides a flow diagram for waste management plan which will be representative of rig waste management operations. The project EMP will provide details of the waste management process to be implemented.

Waste Management Plan

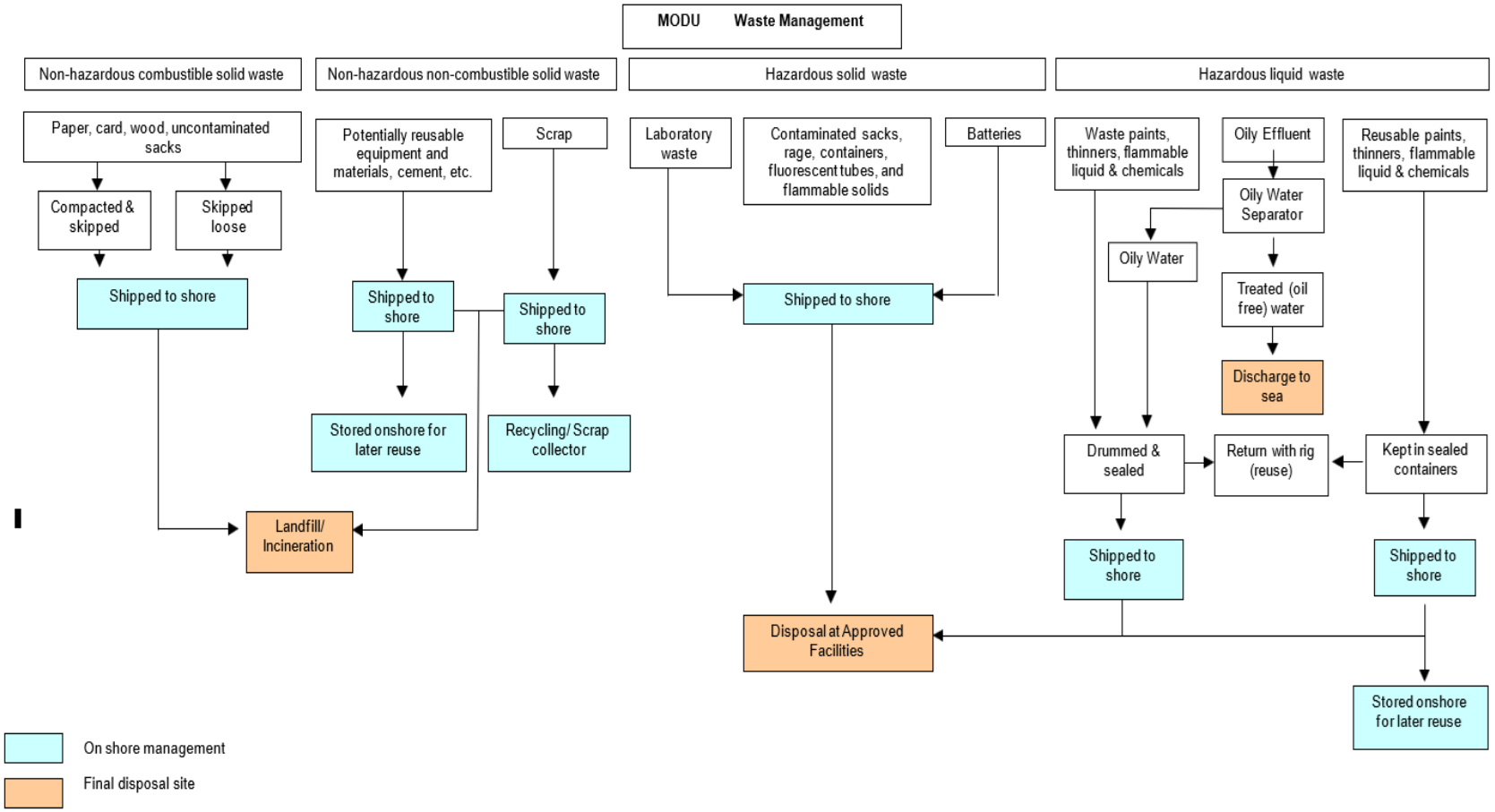


Figure 7-Representative Jack-up rig Waste Management Plan

4.3.6.1 Drainage System

The drainage system on the rig provides controlled contaminated water collection and treatment system with dedicated discharge points as a means of reducing the likelihood of uncontrolled discharge of contaminants into the environment to a level that is ALARP.

At the helideck, an effective drainage system is important to prevent water and aviation fuel ponding on the landing surface. Therefore, the helideck on the jack up rig is designed to always remain free from standing water and fuel accumulations. It is facilitated with gutter and drip trays to prevent spilled or leaked materials from entering the water. The drains will be penetrated by a valve and will be discharged overboard directly. The contaminated water will be collected in a catch tank and transferred to the portable container.

At the main deck, deck drain will capture various fluids and other materials that are spilled or washed onto the deck. In order to prevent the uncontrolled discharge of the deck drain, a perimeter drain system and separate drainage systems for each process area are in place to funnel fluids etc. to the deck drainage system.

Fluids collected by deck drains will be filtered prior to discharge and the contaminated water will be stored in a 'slops' holding tank and pumped to a supply vessel for discharge and processing at an authorised and appropriately certified waste management station.

The heavy machinery and equipment area is equipped with pollution drip pans i.e. rotary table drip pan, draw-works drip pan, etc. The drainage from this area is collected via drip pans under the rig floor and directed to the slops tank before being treated by a separator tank. In term of the mud process area, the drain is directed to a drain sump for treatment. All of the contaminated water and pollutants from these two areas will be finally transferred into a mud contaminated drainage tank, fluids treated to MARPOL standard will be discharged overboard.

4.3.6.2 Jack-Up Rig Effluent Management

During operation, measures aimed at minimizing harmful effects to the receiving environment will be put in place in regard to controlled discharge of liquids such as drilling fluids and cooling water from the vessel and rig. Discharge limits/guidelines as stipulated in MARPOL have been adopted for screening criteria for the Chuditch-2 Appraisal well project.

All liquid discharges will be in accordance with the applicable MARPOL requirement or other applicable standard such as World Bank EHS Guideline for Offshore Oil and Gas Development.

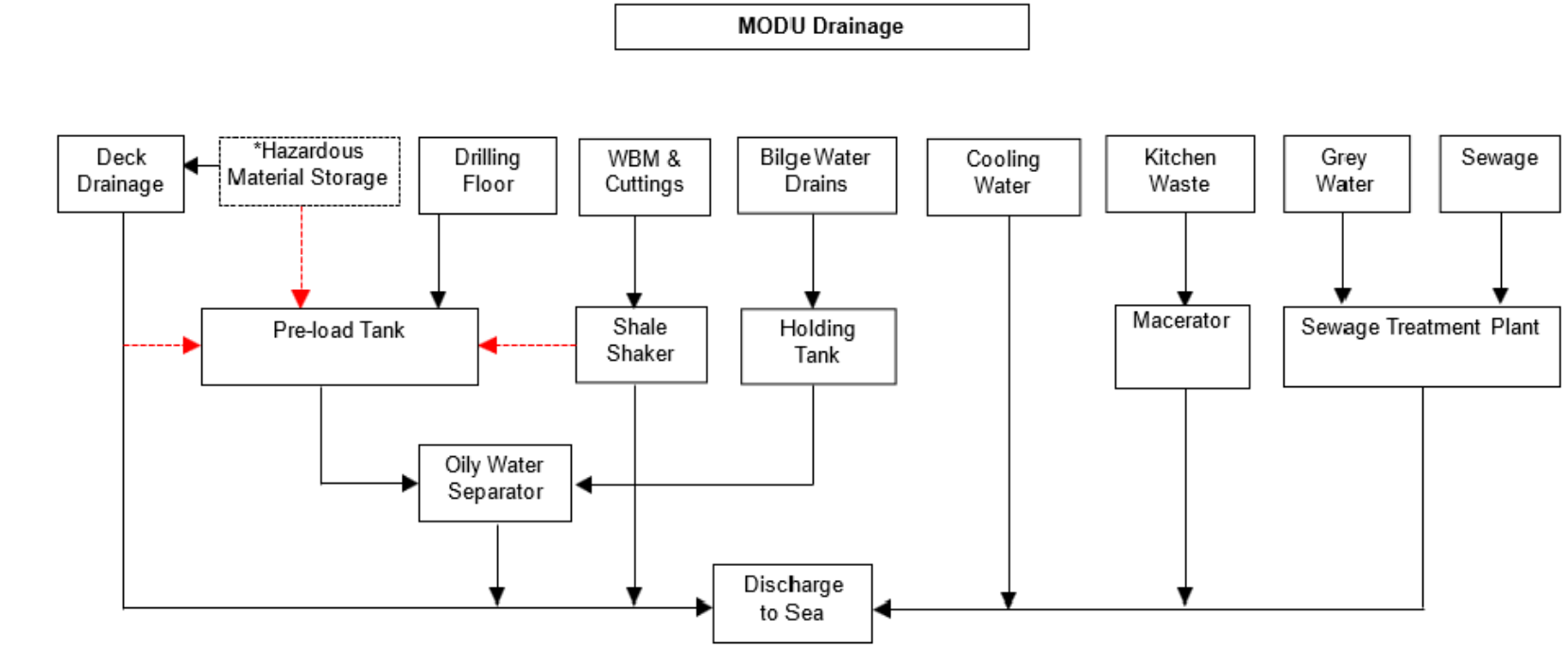
Hazardous materials such as chemicals and used oil will be segregated and transferred back to shore for treatment, recycling and disposal.

Oily/contaminated water will be routed to the oil/water separator and treated to separate the oil which will be transferred to the waste oil tank for transfer to shore for recycling/disposal. Contaminated water will then move to the greywater treatment unit for further treatment before discharge. Grey and black water will be treated and discharged in accordance with MARPOL. MODU effluent management plan is given in Figure 8.

Cleaners and detergents may have an effect on the environment. SGBU will ensure that all chemicals, cleaners and surfactants to be used offshore are approved by the ANP.

Rig wash, a widely used, non-hazardous liquid cleaner, is routinely employed on jack-up rig's and offshore vessels in the maintenance of apparatus and machinery as well as deck areas subject to contamination from crew boots, oil and other products. Wastewater from cleanup on the jack-up rig will be captured by deck drainage and channeled to the oil/water separator where oily substances can be captured, treated, and managed to avoid marine environment contamination. Any chemicals or cleaning agents to be used in this regard will not violate environmental standards on safety or environmental harm and hence will not cause ecological effects.

MODU Effluent Management Plan



Notes:

* Hazardous material storage within deck area

Should water be contaminated, it will be routed for treatment using oily water separator before discharge to sea

Figure 8-Jack-up rig Waste Management Plan

4.3.7 Project Size

The appraisal drilling of Chuditch-2 is located within the contract area PSC TL-SO-19-16 which is approximately 3,571km^2 in total size. The appraisal well is expected to be drilled to target depth of approximately 3,010m in the Plover Formation.

4.3.8 Project Location

The proposed surface location for Chudith-2 well is 5.1 km east of the Chuditch-1 well in approximately 68m of water depth. The well is in Timor-Leste waters approximately 700m from the delineator between Timor-Leste and Australian Exclusive Economic Zones (EEZ). The Chuditch prospect is located approximately 185NM off the south coast Timor-Leste and part of the PSC-TL-SO-19-16 Production Sharing Contract area in the northern Bonaparte Basin. The Chuditch-2 field is located on the Sahul Platform in the Timor Sea, 80km southwest of Greater Sunrise and 140km east-northeast of Bayu-Undan. Figure 9 shows the location of the Chuditch-2 appraisal well in relation to the EEZ boundary and the Oceanic Shoals marine park.

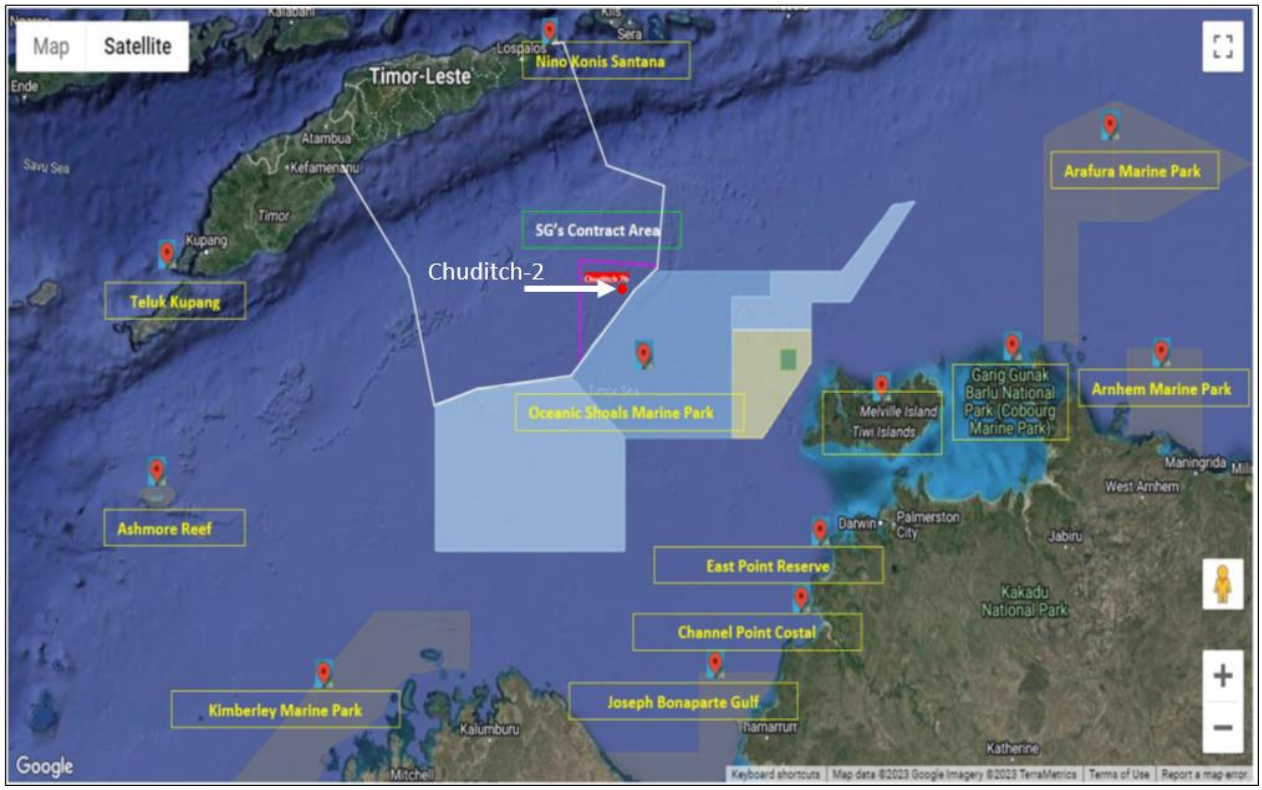


Figure 9-Proposed Chuditch-2 Well Location in reference to EEZ and Oceanic Shoals Marine Park

4.4 Justification and Need of the Project

The Petroleum industry has been identified as a key component in the Timor-Leste Strategic Development Plan (SDP) 2011-2030 for economic development to move the country from low-income to a middle-income nation. The revenue from the petroleum sector can contribute greatly to health care, education, and security of Timor-Leste's people. Additionally, the petroleum sector will be able to create opportunities for the people in Timor-Leste to improve their living standards through high-level employment as well highly skilled professional careers. Human resources improvement and opportunities through training in geology, petroleum and chemical engineering, petroleum finance, and business and project management, as well as for operational staff will occur with development of the hydrocarbons sector. Timorese with appropriate training and skills will be valuable in the petroleum industry, not only in Timor-Leste but in the Asia Pacific region and around the world.

This project will directly assist Timor-Leste in reaching the stated target in the SDP: The private sector will be the primary source of growth in incomes and employment for Timorese. Moreover, SGBU have signed with Government of Timor-Leste through MPRM the Memorandum of Understanding (MoU) of production for SundaGas to supply raw material/gas to the future LNG plant in Natarbora, Manatuto.

4.5 The Proponent's Endorsement of EIS

SGBU is committed to good Industry practice and has rigorously undertaken the Environmental permitting and approval process including the EIS and EMP documents. An EIS is one of the methods by which SundaGas demonstrates transparency and accountability in the planning and execution of an offshore project.

Hence, SGBU endorses the contents of this report and will abide by all recommendations contained herein.

Name	**Andy Butler**	**Signature**
Title	Managing Director SundaGas Banda Unipessoal, Lda	Andy Butler cn=Andy Butler, o=SundaGas Banda Unipessoal Lda, ou=Managing Director, email=andy.butler@sundagas.com, c=SG 2025.05.30 15:47:35 +08'00'
E-mail	Andy.butler@sundagas.com	

4.6 The Structure of EIS

This EIS document is in principle a proposal for protecting the environment, preventing, minimizing and remedying the effects of pollution, and other environmental harms to receptors and stakeholders from the petroleum operations as stipulated in the relevant Environmental Legislation in Chapter 2. The EIS is prepared in accordance with the template provided in Annex 4 of the Diploma Ministerial No.46/2017. Accordingly, the contents of the EIS will be structured as follows:

1. Executive Summary.
2. Details of the Project Proponent.
3. Details of the EIA consultants.
4. Project Description.
5. Policy, Legal, and Institutional Framework
6. Description of the Environment.
7. Climate Change.
8. Alternatives.
9. Impact Assessment and Mitigation Measures.
10. Social Impact Assessment.
11. Economic Assessment.
12. Summary of Environmental Management Plan.
13. Public Consultation and Information Disclosure.
14. Difficulties encountered.
15. Conclusions and recommendations; and
16. Non-Technical Summary.

5. POLICY, LEGAL, AND INSTITUTIONAL FRAMEWORK

This chapter identifies key environmental legislation relevant to this Project and is not intended to provide an extensive legal review of the Project Proponent's obligations.

According to the scope of work, the EIA for this Project should be conducted in accordance with relevant environmental legislation, which includes:

- Regulatory approval of oil and gas development projects is undertaken by ANP under Decree Law No. 39/2022 1st Amendment of Decree Law No.5/2011 on Environmental Licensing which defines the environmental licensing system for public and private projects which are likely to produce environmental and social impacts.
- Government licensing (or approval) of the drilling campaign is required under Timor-Leste Decree-Law No. 39/2022 1st amendment of Decree-Law No. 5/2011 Environmental Licensing prior to the commencement of project operations on location.

As of November 15th, 2023, ANP approved the Project Document (PD) for the proposed Chuditch-2 Appraisal Well Project. Per the approved PD and aforementioned Decree-Law, the planned drilling campaign by SGBU on PSC TL-SO-19-16 is classified as a Category A development as it has "the potential to cause significant adverse impacts", and as prescribed in Ministerial Diploma 46/2017, requires a detailed EIA.

The EIA required under Timor-Leste national law is similar to an Environmental and Social Impact Assessment (ESIA) required for IFC Category A projects. The required TOR was prepared to meet the GoTL requirements and IFC Performance Standards, to guide the preparation of the EIA in accordance with the project approval conditions. During the EIA process, data obtained from the baseline data survey and secondary data is used to prepare the EIS, EMP and Environmental monitoring program for the project including mobilization, drilling, and demobilization.

SGBU will identify and assess the environmental and social risks and impacts of the drilling campaign, design and incorporate appropriate impact avoidance and mitigation measures into the project design, well construction and associated operations. This shall be done in accordance with:

i. National legislation and regulations;

ii. International Standards and Guidelines; and

iii. International Conventions and Agreements.

The details of these laws, regulations, guidelines, action plans, agreements and conventions including their brief description and relevance to the project are shown in Table 14.

Table 14-Applicable Timor-Leste Laws, Regulations, and International Standards and Guidelines.

Title	Descriptions	Relevance to the Project
Timor-Leste Legislation and Regulations		
Constitutions of the Republic Democratic of Timor-Leste Article 61 (Environment).	The article specifies provisions for state including the proponent shall undertake to defend, and safeguard the environment recognizes the right of all citizens to a humane, health and ecologically balances environment while also specifying the duty of everyone to preserve and protect the environment for the benefit of future generation.	Provides the basis for environmental protection and safeguarding in the Country.
Decree Law No. 39/2022 - the first alteration of the Decree Law no. 5/2011 about the Environmental Licensing.	The procedure for directing the environmental assessment, the review of application for environmental license, issuance and renewal of license. • Categorization of the project according to severity of the environmental impacts. • Procedures and information requirement for Category A project • Organization and composition of the review committee and its duties and responsibilities. • Specific provisions for public consultation and the protection of the traditional customs and cultural practices. • The issuance of the decision by the Environment Authority on the review of the application and the rights of the project owner to appeal the decision.	Categorization of the project according to severity of the environmental impacts. Procedures and information requirement for Category A project Provides the Environmental Licensing procedure
Decree Law No. 5/2016 – National System of Protected Areas (Appendix 1 – List of Timor-Leste	The Decree Law defines the norms and principles for the creation of the national system of terrestrial and marine protected areas, for the classification of protected areas and for	Defines for the protection of the terrestrial and marine protected areas

Title	Descriptions	Relevance to the Project
Protected Areas).	the approval of the applicable management instruments, according to the international best practices, in the matter, duly adapted the national reality, without forgetting the important role of community authorities and existing customs.	
Decree Law No. 26/2012 on Basic Environmental Law	The Decree Law identifies the protection of the environmental life and wildlife protection, including the basic principles for the conservation, preservation, and sustainable use of natural resources in order to improve the quality of life of the local populations.	Defines sustainable use of natural resources, conservation and preservation of natural resources
Decree Law No. 6/2020 Legal Regime for protection and the conservation of biodiversity	The decree law sets a legal regime for the conservation of biodiversity, and the sustainable use of its component.	To protect and conserve the biodiversity, including marine species and their habitat around the drilling project.
Diploma Ministerial No.45/2017 – Rules and Procedures of the Evaluation Committee for Project with Category A	The article specifies the importance of establishing rules and procedures for the evaluation committee for the management of the environmental evaluation process for projects in category A	Establishment of a committee in order to review the project that categorize into category A.
Diploma Ministerial No. 46/2017 - Regulation on the Detailed Requirements for Screening, Scoping and TOR, EIS and EMP.	The article specifies details requirement for Screening, Baseline Study, Term of Reference, EIA, EIS, and EMP including language to be used in the aforementioned documents and their minimum content requirement.	Mandates requirements and obtaining approval for TOR, EIS, and EMP
Diploma Ministerial No.47/2017 – Public Consultation Procedure and Requirement during Environmental Baseline Process	The Diploma Ministerial specifies the procedures and requirement of involvement of public and communities into different stages of the environmental assessment process through public consultation.	Specifies the procedures and requirement of involvement of public and communities into different stages of the environmental assessment process through public

Title	Descriptions	Relevance to the Project
		consultation.
Decree Law No. 59/2023 – Organic structure of the Ministry of Petroleum and Mineral Resources	Constitutional Article 33 (c) (Minister of Petroleum and Minerals) responsibilities item (o) Considering the complexity and technical expertise of the oil and mineral resources sector, conduct the respective environmental licensing procedures and approve the corresponding environmental licenses in that sector.	Provides a description of legal framework that empower Ministry of Petroleum and Minerals to issue environmental license.
Decree-Law No.32/2016 Offshore Petroleum Operations	The decree law applies to all offshore petroleum operations, which is carried out in accordance with the law on petroleum activities, including the transport and storage of crude oil and natural gas, with a direct impact on any deposits. This decree law also sets the requirements, including the Environmental impact statement, Environmental Management Plan, Environmental monitoring, and Oil Spill Contingency Plan.	Sets the requirements, including the Environmental impact statement, Environmental Management Plan, Environmental monitoring, and Oil Spill Contingency Plan.
Labour Legislation Law No. 4/2012 – Timor-Leste Labour Code	The law describes the rights between employers and workers regarding the working hours, leaves, remunerations, compensations and health and safety welfare	Provides basis for the project proponent to set up a working condition and contracts between employer and employee and used during the project activities.
Government Resolution No. 27/2023 about the Ocean National Policy of Timor-Leste	The national policy intends to address the national marine issues, including pollution and climate change.	The drilling activity will take place in the Timorese water, and to find integrated approach based on the national policy to mitigate the drilling impact to the ocean.
International Industry and Guidelines Documents		
IFC EHS General Guidelines 2007	The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International	Provides general guidance on the application of good environmental practice.

Title	Descriptions	Relevance to the Project
	Industry Practice.	
IFC EHS (June 2015) guidelines for offshore oil and gas development.	The guidelines are industry specific for offshore oil and gas development and are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.	Provides guidance on the application of good environmental practice for offshore oil and gas development.
United Nations Convention on Biological Diversity (UNCBD)	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has 3 main objectives: 1. The conservation of biological diversity 2. The sustainable use of the components of biological diversity 3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources	Timor-Leste is a biodiverse and significant ecosystem with many endemic species. The country signed the convention in 2001. As the project could have impacts on the flora and fauna or risk to the loss of the biodiversity, it is fundamental principle for the project proponent to prevent or minimize the risk of biodiversity loss during the project implementation
United Nations Framework for Climate Change Convention (UNFCCC)	The United Nations Framework Convention on Climate Change (UNFCCC) provides a framework for intergovernmental efforts to reduce greenhouse gas emissions and adapt to the expected impacts of climate change. It also provides guidance to member states on developing and implementing national climate change strategies, incorporating both adaptation and mitigation actions. Timor-Leste became a signatory to the UNFCC in October 2006.	The project activities release GHG emissions which could be one of the contributing factors to the country's climate change issue. Minimization climate change risks by reducing the GHG emissions are an essential part of the project environmental objective and target. This convention is the principal guidance for the project proponent to prevent the air pollution and reduce the GHG emissions as much as possible
IPIECA Guideline	Social responsibility, application of good environmental practice. IPIECA is a not-	Provides oil and gas industry specific guidance

Title	Descriptions	Relevance to the Project
	for-profit association that provides a forum for encouraging continuous improvement in industry performance. IPIECA is the only global association involving both the upstream and downstream oil and gas industry. It is also the industry's principal channel of communication with the United Nations. IPIECA develops, shares and promotes good practice and knowledge to help the industry and improve its environmental and social performance. This is done with the understanding that the issues that dominate the sustainable development agenda – climate and energy, environmental and social issues – are too big for individual companies to tackle alone. The industry must work together to achieve improvements that have real impact. IPIECA helps to achieve this goal.	on the application of good environmental practice.
International Union for Convention of Nature (IUCN)	The international convention is an international organization focus on the nature conservation and sustainable of utilizing the natural resources. The IUCN works in the field to promote ecological conservation in order to ensure the sustainable development concepts.	Timor-Leste is a signatory member of the IUCN convention which has responsibility to protect its ecological components to ensure the economic sustainable development. Therefore, this project will identify all species categories listed under the IUCN red list which can be impacted by the project activities
International Finance Corporation performance standards 1, 3 & 6.	Performance Standard 1 – Assessment & Management of Environmental and Social Risks and impacts establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects including effective community engagement and consultation with local communities on matters that directly affect them, management of environmental and social performance	Provides internationally recognized guidance on the conduct of EIA process

Title	Descriptions	Relevance to the Project
	throughout the life of the project.	
	Performance Standard 3 - Resource Efficiency & Pollution Prevention- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. To promote more sustainable use of resources, including energy and water. To reduce project-related GHG emissions.	Provides internationally recognized guidance on best practice to avoid / minimize environmental and social impacts, promoting reduction of GHG emissions
	Performance Standard 6- Biodiversity Conservation and Sustainable Management of Living Natural Resources. Habitat is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment. For the purposes of implementation of this Performance Standard, habitats are divided into modified, natural, and critical. Critical habitats are a subset of modified or natural habitats. To protect and conserve biodiversity. To maintain the benefits from ecosystem services. To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	Provides internationally recognized guidance on best practice to marine habitat protection and conservation of biodiversity in the planning of offshore projects
WHO Air Quality Guidelines (AQG)	WHO Air Quality Guidelines (AQG) offer guidance on threshold limits for key air pollutants that pose health risks and provide a reference for setting air pollution targets at regional and national levels to improve air quality. Air quality guidelines have been published by WHO in 1987 and they were revised in 1997. The 2005 update represents the most current assessment of air pollution health effects, based on an	The air quality benchmark used as reference by the project proponent is the WHO air quality guidelines.

Title	Descriptions	Relevance to the Project
	expert evaluation of the scientific evidence. The guidelines offer recommended exposure levels for particulate matter (PM_{10} and $PM_{2.5}$), ozone, nitrogen dioxide and sulphur dioxide, as well as a set of interim targets to encourage a progressive improvement in air quality.	
Climate Change Kyoto Protocols. Government Resolution of National Action Plan for Climate Change	Kyoto Protocol is an international treaty which extends the UNFCCC parties commitment to reduce the greenhouse gas according to the scientific consensus. The protocol implements the objective of reducing the global warming potential gas in the atmospheres. The government resolution of national action plan for climate change (NAPA) is the first national document that identifies urgent and immediate climate change adaptation needs of the most vulnerable groups. It provides a starting point from which climate change adaptation can be mainstreamed into development plans as a key strategy for attaining sustainable development and poverty reduction (MDG, 2010)	Timor-Leste is the signatory party of the Kyoto Protocol which shall ensure the implementation of the protocol in order to reduce the GHG emissions.
ANZECC & ARMCANZ (2000) – Australian and New Zealand Guidelines for Fresh and Marine Water Quality	These guidelines provide a summary of water and sediment quality parameters and their 'trigger values' to protect and manage environment of the fresh and marine water. Additionally, it provides advice on designing and implementing water quality monitoring and assessment programs.	The water and sediment quality parameters are adopted for the purpose of this project. The 'trigger values' are used as a benchmark for all the parameters used for environmental baseline survey as well as monitoring program.
United Nations Convention on the Law of the Sea, 1982 (UNCLOS)	The convention on the Law of the Sea lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources. It enshrines the notion that all problems of ocean space are closely interrelated	Relates to EEZ Governance and sovereign rights/National area of the seabed.

Title	Descriptions	Relevance to the Project
	and need to be addressed as a whole. Coastal States have sovereign rights over the continental shelf (the national area of the seabed) for exploring and exploiting it; the shelf can extend at least 200 nautical miles from the shore, and more under specified circumstances	
London Convention on the Prevention of Marine Pollution by dumping of wastes and other matter, 1972 (London Convention).	The convention is an agreement to control pollution of the sea by intentional disposal at sea of potentially harmful materials	Any chemical inventories onboard the survey vessel will be adequately transported and stored in suitable containers to prevent accidental discharge to the sea.
SOLAS 1974 – International Convention for the Safety Life of Sea	The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment, and operation of ships, compatible with their safety. Flag States are responsible for ensuring that ships under their flag comply with its requirements, and a number of certificates are prescribed in the Convention as proof that this has been done.	There will be vessel movement during mobilization, well construction and demobilization of the rig.
MARPOL 73/78 – The international Convention for the Prevention of Pollution from Ships.	The international convention is the main convention covering prevention of pollution of the marine environment by ships/vessels from operation or accidental causes. The objective of this convention is to reduce the volumes of the harmful material entering marine environment. • Annex I – Regulations for the Prevention of Pollution from Oil • Annex IV – Regulations for the Prevention of Pollution by Sewage from Ships • Annex V – Regulations for the Prevention of Pollution by Garbage from Ships • Annex VI – Regulations for the Prevention of Air Pollution from	The survey vessel is required to comply with the provisions of MARPOL.

Title	Descriptions	Relevance to the Project
	Ships	
International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW)	This convention provides a standardized approach to the qualifications and competencies of masters, officers and watch personnel and is essential to navigation of vessel and safety crew.	The vessels and crews are required to comply with STCW.
International Regulations for Collisions at Sea 1972 (COLREGS)	These regulations provide internationally agreed rules for the navigation of vessels, which are intended to reduce the likelihood of vessel collisions.	The vessels and rig are required to comply with COLREGS.
Offshore Chemical Notification Scheme (OCNS) and Chemical Hazard and Risk Management (CHARM)	Chemical List/registration for offshore oil and gas application. Within this standard, there is Oslo and Paris (OSPAR) convention where it is used to prevent and combat pollution, protect the marine environment from impacting effects of human activities, preserve and restore marine ecosystems and safeguard human health.	The OSPAR Pose Little or No Risk to the Environment (PLONOR) list which will be use by Sunda to evaluate chemical discharge to the marine environment around the proposed project location.

6. DESCRIPTION OF THE ENVIRONMENT

This chapter is prepared using secondary, published information and according to the approved Terms of Reference (TOR) - Drilling Activities PSC TL-SO-19-16 dated November 2024, along with data and information from the Chuditch-2 Environmental Baseline Survey (EBS) Technical Report dated March/April 2025.

The Timor Sea and its tropical marine environment support significant and growing economic activity including oil and gas exploration. To reduce uncertainty in decision making regarding the sustainable use and ongoing protection of these marine resources, environmental baseline studies and data are important to describe the existing environment.

Timor Sea region is tropical with two distinct seasons having a dry season and monsoon season. These govern the climate, ecological and biological components. This section has used both secondary and primary environmental baseline data.

The approved EBS was conducted in February 2025 and the information gathered is considered while writing this section. The baseline conditions of the existing environment have thus formed the basis of valuable insight into the natural, ecological, economic, social, and cultural features of the project area. The description of environment is used while writing the possible impacts that may arise from the Chuditch-2 project which are considered crucial in writing the environmental management statement.

6.1 Physical Component

These elements focus on those aspects of the physical environment and considering how natural processes can relate to or be affected by the appraisal drilling project.

6.1.1 Climate

The Bonaparte Basin and Timor Sea region experience a tropical climate and distinct summer monsoonal ‘wet’ season from October to March and followed by a typical cooled winter ‘dry’ season from April to September. The two seasons go through a rapid transitioning, usually in April and September-October due to two major atmospheric pressure system affecting the region. These atmospheric pressures are the subtropical ridge of high-pressure cells and a broad tropical low pressure or Monsoon Trough.

The subtropical highs move from west to east across the Southern Indian Ocean in winter, and further South in summer, usually separated by low pressure troughs or cold fronts. The

highs provide the driving force behind the Southeast trade winds which dominate the Timor Sea in winter months.

The Monsoon trough or Inter-Tropical Convergence Zone (ITCZ) is a broad area of low atmospheric pressure running East-West through the tropics in the summer months.

During the wet season the South-Westerly winds can generate thunderstorm activity, high rainfall and cyclones. While in the dry season the Easterly winds result in dry and warm conditions with very little rainfall (RPS, 2024).

There have been no major catastrophic climate incidents in the past years in the area of the Chuditch-2 appraisal drilling campaign nor is there any data to suggest the negligible and transient impacts to the receiving environment generated by the Chuditch-2 well activities will contribute to a measurable impact to climate change.

6.1.2 Rainfall

During 'dry' season (April to September), rainfall in the north is low to non-existent in most areas, although light showers are common closer to the coast in the southern waters of the Timor Sea.

During the wet season, the weather on the south coast of Timor-Leste is largely determined by the position of the monsoon trough, which can be in either an active or inactive phase. The active phase is usually associated with broad areas of cloud and rain, with sustained moderate to fresh north-westerly winds on the north side of the trough. Widespread heavy rainfall can result if the trough is close to or over land. An active phase occurs when the monsoon trough is temporarily weakened or retreats northwards. It is characterised by light winds, isolated showers, and thunderstorm activity, sometimes with gusty squall lines.

High rainfall is associated with the Northwest Monsoon and low rainfall with the Southeast Monsoon. Heavy rainfalls are also associated with tropical cyclones and thunderstorm activity. Mean annual rainfall for the Timor Sea region is 1,770mm (Heyward et al., 1997). Mean air temperatures recorded at the Jabiru Floating Production, Storage and Offloading (FPSO) vessel, approximately 180NM south of Timor-Leste in the Timor Sea, are 24.9°C in July and 29.6°C in December (URS, 2002). Figure 10 below shows a graph of Timor-Leste Climate and weather data.

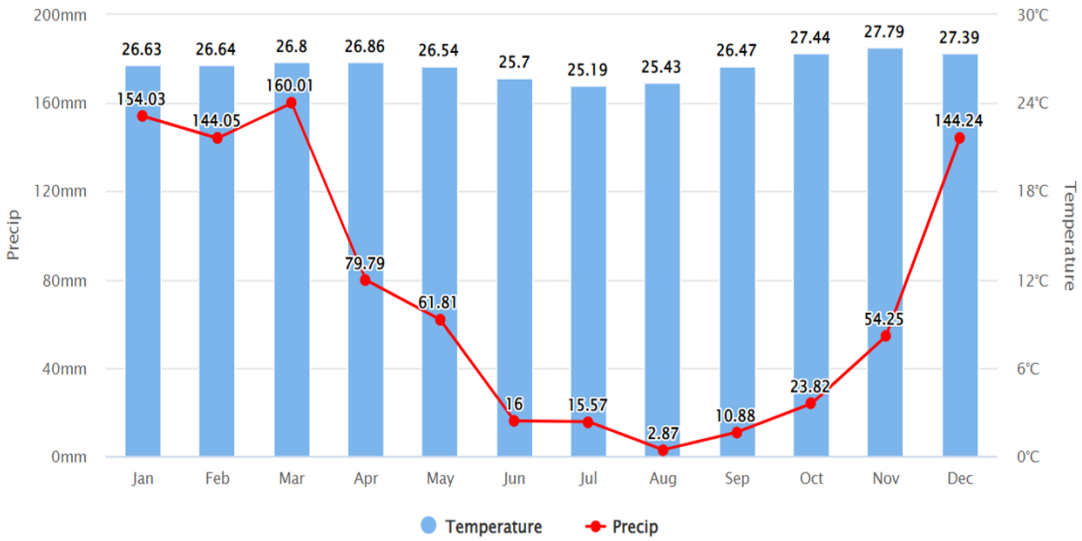


Figure 10-Timor-Leste climate and weather data-the global historical weather and climate

6.1.3 Oceanography

The main forces contributing to surface water movement in the vicinity of Chuditch Area are:

- General oceanic circulation;
- Astronomical tides; and
- Wind stress.

The Pacific–Indian through-flow flows south through the Indonesian Archipelago and into the Eastern Indian Ocean bathing it in warm, relatively low salinity seawater. Figure 11 shows the regional synoptic-scale currents of northern Australia and the Timor Sea.

Within the permit area, 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).

The majority of water movement off northern Australia and the Timor Sea is poleward, with the water being relatively warm and low in nutrients (DEWHA, 2008). A strong seasonal wind regime is closely associated with seasonality in surface currents in the region, including the seasonal strength of trade winds in the equatorial Pacific Ocean which drive the Indonesian through-flow (ITF).

The Chuditch location is situated near the EEZ delineation between Timor-Leste and Australian territorial waters and experiences semi diurnal tides. Tidal ranges are large – 0.8m neap and up to 7m spring tides (RPS, 2018) and thus strongly influence currents in the region, notably, tidal amplitudes appear to be retained at long distances offshore and travel initially in a north easterly direction in the deeper waters of the region (RPS, 2018).

The tidal current component is imposed over the synoptic scale flow. In addition to the synoptic-scale and tidal currents, locally generated wind-driven currents also influence water movement within the area. These appear to be more variable and are superimposed over large-scale flows.

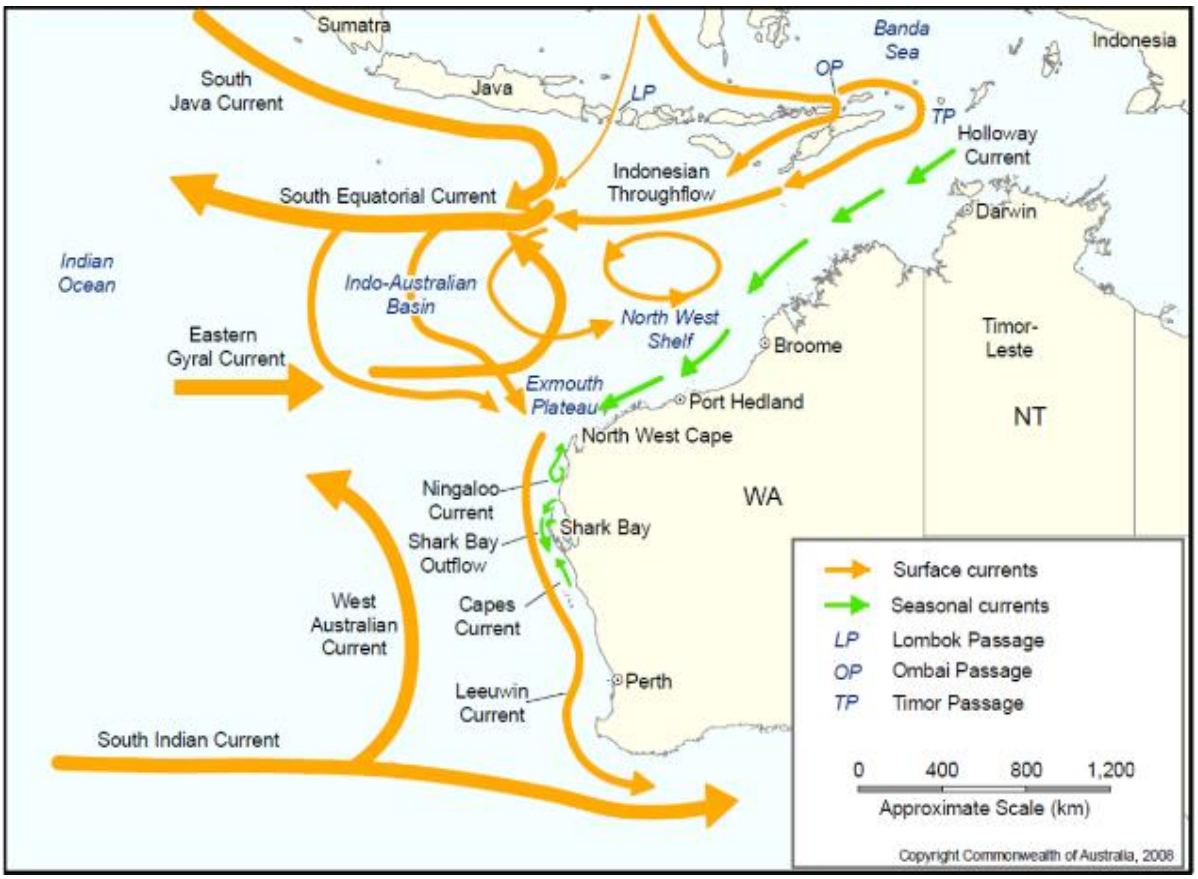


Figure 11-Regional synoptic-scale currents of northern Australia and the Timor Sea (Source: DEWHA, 2008)

6.1.4 Winds

The dry season (April to September) is characterized by steady northeast to southeast winds of 5 to 12m/s driven by the southeast Trade Winds over the Timor Sea.

The 'wet' season (October to March) is characterized by northwest to southwest winds of 5m/s for periods of 5 to 10 days with surges in mean wind speeds of 8 to 12m/s for periods of 1 to 3 days.

During the transition season (September to October), with seasonal low-pressure systems sweeping across the Australian mainland West to East, the surface wind in the Timor Sea possesses a westerly component with a light wind of less than 5m/s. While during the transition season in April, the wind is charactered by southeasterlies for a period and then returns to northwest airflow (RPS, 2024).

6.1.5 Cyclonic Weather Systems

The Bonaparte Basin is prone to tropical cyclones during the wet season. Under extreme cyclonic conditions, 10-minute sustained wind speeds can exceed 205km/h with gusts reaching as high as 408km/h (Cyclone Olivia – Aus BOM, 1996).

Tropical cyclones develop in the Timor Sea in the northern wet season, usually forming within an active monsoon trough. Tropical Lows and Cyclones may also develop in the Coral Sea and move through the Torres Strait, usually as a tropical low or low range cyclone and may strengthen through the Gulf of Carpentaria region or in the Timor Sea (ABOM, 2024).

Heavy rain and strong winds, sometimes of destructive strength can be experienced along coastlines within several hundred kilometres of the centre of large cyclonic systems.

Most tropical lows and cyclonic systems pass through the area in a west or southwest direction before turning southwards.

Fully mature tropical cyclones range in size from 100km in diameter to 1,500km (Cyclone Justin 3/03/1997, Aus BOM). Tropical cyclones typically have a distinct life cycle of about 4 to 7 days although some category 1 systems briefly reach gale force while other systems can be sustained for weeks at various levels of intensity or degrade to tropical low status before reforming.

The most active months for tropical cyclones in the Timor Sea/Bonaparte Basin region are December to April, when the surface temperatures are at their highest and the water column is at or above 26.7°C (SKM, 2001).

Most (75%) of these cyclones are not fully mature, with estimated wind speeds of less than ~80km/h. Severe cyclones, with wind speeds exceeding 100km/h occur, on average, once every 2.6 years (Heyward et al., 1997).

6.1.6 Seismicity and Tsunamis

The Timor Sea has experienced tectonic activity for at least six million years due to the convergence of the Australian and Eurasian continental plates. The dominant earthquakes in this area are subduction and strike-slip related earthquakes, caused by one crustal plate being forced below another. Earthquake activity tends to be focused to the north of the island of Timor, along the Flores-Wetar trend and further west in the Lombok Basin. The contract area south of the Timor Trough on the Australian continental plate, in an area with very limited seismicity and no recorded tsunamis. Figure 12 shows the locations of seismicity and tsunamis in the Banda and Timor Seas region.

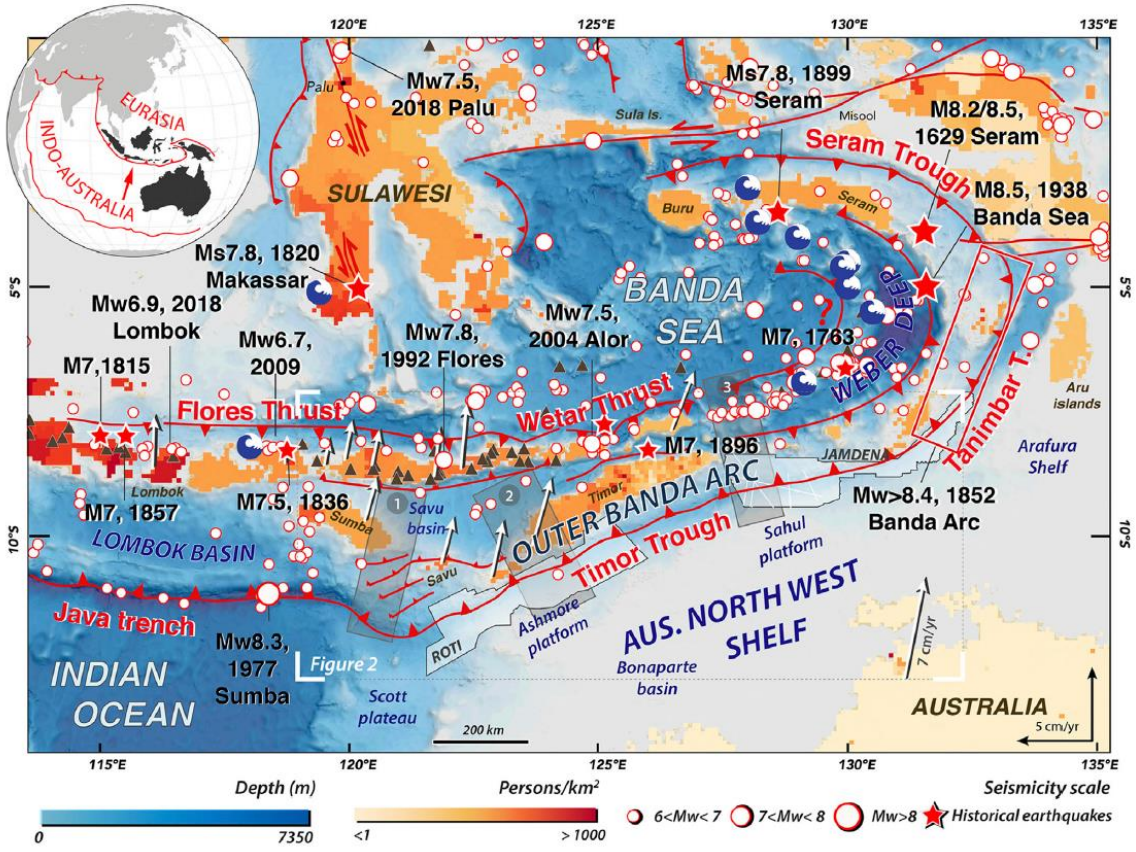


Figure 12-Seismo-tectonic setting of the Banda Arc region, based on seismicity from USGS catalog (1976–2020) are represented by red and white dots. Blue wave symbols are past tsunamis. Major faults (in red). (Source: Coudurier-Curveur et al, 2023)

6.1.7 Geology

The primary hydrocarbon reservoir in the Bonaparte Basin is sandstone of the Plover Formation, ranging from Early Jurassic to Callovian age. The G&G site survey in early 2024 indicated that the benthic topography is approximately 68 meters, and live coral reefs, which typically thrive in shallower, sunlit waters, are absent. The bathymetry and seabed topography data derived from previous seismic surveys acquired by Shell and Minza in 2009 and 2012 show that the seabed within the proposed drilling areas is relatively flat aside from the large sea floor channel. The ROV survey conducted during the EBS indicates substrate composition of soft sediments (sand/mud and hard substrates (rock, pebbles/ gravel-rubble)) in some localized areas around the well, creating complex topography features. The Chuditch-2 well, based on offset data is prognosed to encounter 'near-dry' gas in the Plover Formation.

The regional stratigraphy in the area includes various formations spanning different geological periods:

1. Plover Formation (Pliensbachian to Callovian): Primary reservoir target, comprising fluvio-deltaic sandstone, mudstone, coals, and marginal marine sandstone. At Chuditch-1, it underlies shales of the Jurassic Flamingo Formation.
2. Flamingo Formation: Deep marine shales and turbiditic sandstone sourced from the south, displaying different depositional facies on the Sahul Platform, including marginal marine sandstone equivalent to the Sandpiper Sandstone south of the Malita Graben.
3. Bathurst Island Group: Comprising several sequences:
    - Echuca Shoals Formation: Glauconitic claystone and siltstone overlying the Intra-Valanginian Disconformity.
    - Darwin Formation (Aptian to Early Albian): Condensed radiolarian claystone/calcilutite unit deposited during the Cretaceous transgression.
    - Wangarlu and Vee Formation: Claystone, marls, and calcilutites deposited in a marine shelf to slope environment.
4. Johnson Formation (Palaeocene) and Hibernia Formation (Eocene): Mainly calcilutites with dolomites, cherts, and claystone streaks.
5. Cartier Formation (Oligocene): Calcareous claystone and marls.

6. Oliver Formation (Miocene): Continuous carbonate deposition with an unconformity at the top due to the collision of the Australian and southeast Asian plates.
7. Barracouta Formation (Pliocene to Recent): Active margin carbonates overlying the Miocene unconformably.

The estimated target formation tops are 2,813m TVD-MSL (Chuditch-2) and the geology of the Chuditch-2 well is shown in Table 15 below.

Table 15-Geology Structure of Chuditch-2 Appraisal Well

	Chuditch-2 Depth TVD-MSL (m)	Uncertainty (m) (TBC)
Sea Bed Carbonates	67	+/- 5
Hibernia Fm (Green horizon) Calcarenites & calcilutites grading to calcareous clay stones	688	+/- 20
Johnson Fm (Pink horizon) Argillaceous calcilutites to calcareous clay stones	1088	+/- 20
Wangarlu Fm (Purple horizon) Claystone with minor calcareous claystone	2000	+/- 20
Darwin Fm (Pink horizon) "radiolarite" Claystone & marl	2799	+/- 30
Plover Fm – reservoir target Sandstones & clay stones	2813	+/- 30
Gas-water-contact	2920	+/- 3
Total Depth	**3010**	**+/- 30**

6.1.8 Air

The air quality is normally good in offshore location, although emissions from shipping, drilling and other offshore activities will contribute to localized air pollution. The appraisal drilling program is of a short duration of about 44 days. The diesel driven power generators of the MODU and support vessels and the gas turbine engines of helicopter servicing the rig generate some pollutants, namely SO_2, NO_x, and CO which will be discharged into the atmosphere through exhaust stacks of suitable heights to ensure noxious gases are directed away from crew accommodation. Therefore, impacts of gaseous pollutants on the ambient

air quality due to drilling operations are insignificant. Moreover, the drilling location is located at a distance beyond territorial waters from the shores of Timor-Leste and Australia. The impact of pollutants discharged in exhaust gases from the diesel driven power generators of the MODU in the offshore area will be minimal. The generators are maintained as per manufacturers criteria.

The air sampling was not included in EBS prior to drilling activities as the operational area is approximately 240km from the Timor-Leste coastline, which itself is a remote and non-industrialized area.

Secondary data shows that the air temperature variations are small. The mean maximum summer and winter air temperature recorded at Point Fawcett on Melville Island as the closest metrological station to the project area range between 33-34°C in November/December. The annual minimum temperature is 27°C in June (RPS, 2024). The average tropical cyclone frequency for the Timor and Arafura seas region is one cyclone per year with cyclones most commonly occurring between December and April (RPS, 2024).

6.1.9 Marine Waters

Information in this section is taken from the Chuditch-2 EBS Technical Report dated March/April 2025, conducted by WA Marine Pty Ltd trading as O2 Marine, Western Australia. The data, figures and tables and information is reproduced from that report as primary information around the planned Chuditch-2 Appraisal Well Program.

Generally, the marine waters in the Timor Sea are pristine, with high values of dissolved oxygen and low levels of pollutants. Baseline water quality parameters such as salinity, temperature, and nutrient levels are critical to any assessment of potential impacts due to drilling activities.

Environmental Baseline water quality data allows for an assessment of potential impacts caused by drilling operations, such as the discharge of drilling mud, drilling fluids, and other pollutants. The EBS measured relevant water quality for physical, chemical and biological parameters, including heavy metals, hydrocarbons and other pollutants related to the discharges.

The criteria of selection the locations and criteria parameters are based on OSPAR Commission Assessment of the impacts of the offshore oil and gas industry on the marine environment and the results as per NATA (National Association of Testing Authorities)

accredited laboratory-Analytical Reference Laboratory (ARL), ANZG (2018) and IMCRA (2018) guidelines. ANZECC and ARMCANZ (2000) guidelines are used to evaluate the marine water quality, sediment quality, and toxicants from the proposed project.

EBS Sampling Summary

The EBS was conducted in February 2025 with laboratory analysis occurring immediately afterwards encompassing the extent of potential impacts to water quality, sediment quality and benthic habitats based on the mud and cuttings dispersion modelling for the drilling program (MuTek, 2024) to design the sampling plan for impacts on potential receptors.

The sampling design and rationale for the scope of works has been presented by RPS in the Scope of Chuditch-2 Environmental Baseline Study [AU213017880.001] document (RPS, 2024).

The sampling design is grouped as follows:

- At the well location and in the immediate vicinity (direct impact, benthic impact zone);
- 300m from the well location (potential for benthic impact);
- 600m from the well location (furthest potential extent for benthic impact);
- Relief well location; and
- 1000m from the well location (potential low water quality impact).

Sampling Location

Sampling locations for the Chuditch-2 Environmental Baseline Survey were selected to ensure relevance to cuttings dispersion modelling. The number of sites required for sampling is outlined in Table 16. The EBS sampling locations around Chuditch-2 Appraisal Well are presented in Figure 13.

Table 16-Sampling location and Numbers of sites completed

Task	Sample	Required number of sites	Number of sites completed
Water quality sampling	Water samples	12	12
	Water column profiles	12	12
Sediment sampling	Sediment samples	13	13
	Infauna	1 3	13

Task	Sample	Required number of sites	Number of sites completed
Benthic Habitat Assessment	Towed camera	8	8
Marine fauna sightings	Opportunistic sightings	N/A	N/A

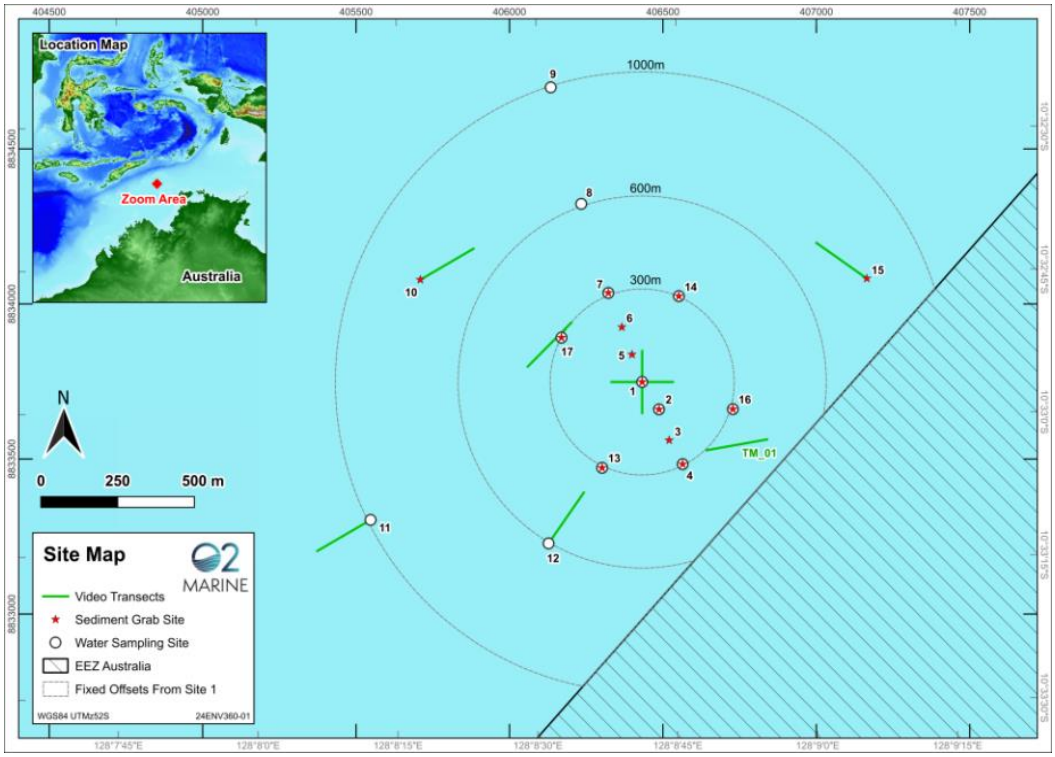


Figure 13-EBS Sampling locations around Chuditch-2 Appraisal Well

Water quality samples were collected using Niskin bottles (Figure 14) which was then analysed in a NATA certified laboratory for suspended solids, heavy metals, and hydrocarbons.

Figure 14-Niskin bottle water sampler used for water quality sample collection

Water samples were collected at the sea surface (1-5m depth), mid-column (~30m depth) and near bottom (seabed+ 1-5m) using 10 litre Niskin bottles.

Water samples were then stored and transported to laboratories for analyses which comply with industry standards (e.g. SW-PACK-012 for Environmental Monitoring at Environmental Analysis Laboratory).

Water Column Quality Profiling

A Conductivity, Temperature and Depth (CTD) profiler (Figure 15) was used to measure water temperature and salinity in the water column and inform the water sampling analyses and provided useful environmental baselines for the area.

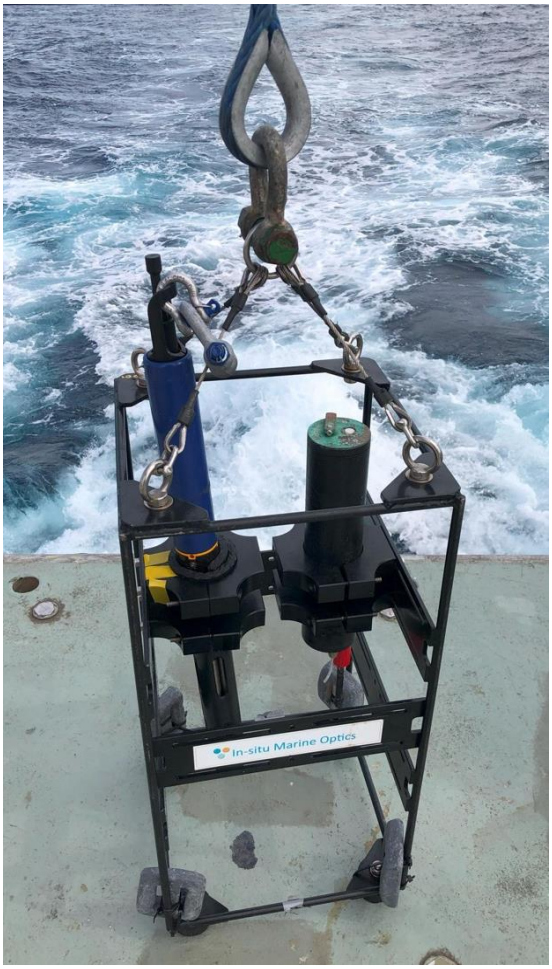


Figure 15-YSI Exo1 Sonde and IMO Ms9 light

Water column profiles were collected in accordance with the SAQP. The CTD profiler recorded the following parameters:

- Time;
- Depth;
- Temperature;
- Specific conductivity (SpC);
- Salinity (ppt);
- pH;
- PAR (9 wavelength multispectral sensor);
- Turbidity (NTU) and;
- DissolvedOxygen (DO) (%).

The summary of physiochemical water column profiles from the EBS are:

Physiochemical Profiles

The physiochemical water column profiles in summary are:

- pH results ranged from between 8.21 and 8.26
- Salinity results ranged between 34.05 and 34.19
- Temperature values ranged between 28.77 and 30.29
- Conductivity results ranged between 51990.00 and 52147.10
- Turbidity values ranged between 0.06 and 0.26.
- Minimal spatial variability in water quality across the project area.
- Temperature, salinity, turbidity, and pH remained stable from surface to seafloor.
- Slight thermocline detected at 22–25m depth.
- Dissolved oxygen (DO) levels were high (~95%) but decreased slightly below 25m, indicating a stratified water column.
- Low turbidity levels indicate minimal sediment resuspension and particulate matter.

PAR Profiles

The light penetration results from the light Photosynthetically Active Radiation (PAR) tests from the water column profiles are summarized in Table 17 across all locations measured under the EBS survey in February 2025.

Table 17-PAR values from EBS Survey across all locations

Location	Mean	Minimum	Maximum
Surface	467.2	92.79	1115.8
Bottom	1.42	0.57	2.98

Water Samples EBS Analysis Results

The water samples were analyzed for the following parameters.

- Total Recoverable Hydrocarbons (TRH);
- Total aromatic hydrocarbons;
- BTEX (benzene, toluene, ethylbenzene and xylene);
- Polycyclic aromatic hydrocarbons;
- Oil and grease;

- Sulphur;
- Heavy metals (As, Ba, Cd, Cr, Co, Cu, Hg, Ni, Pb, Zn, Mg, Fe, Se);
- Chlorophyll-a; and
- Total organic carbon.

The samples were analysed at NATA-accredited laboratories in Australia.

The analytical results are summarized below:

Dissolved Metals

The dissolved metals results across all EBS locations sampled are in summary:

Gold, mercury and manganese results were reported below the LOR in all samples.

Generally, for the metals (As, Ba, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni, Sb, Se) analysis data all reported at low concentrations below ANZG (2018) 95% and 99% Special Protective levels (SPLs).

Hydrocarbons

Hydrocarbons results from water samples for BTEXN, TPH, TRH, and VOCs were all reported below the Limit of Reporting (LOR).

Chlorophyll-α

Chlorophyll-α was reported below the LOR in all water quality samples.

Oil and Grease

Oil and Grease values ranged between <5mg/L and 9mg/L and the Median oil and grease results across all sampling sites was <5mg/L.

Sulphur

Sulphur results ranged between 980mg/L and 1300mg/L. The Sulphur results were generally consistent between sites and across depths.

The details results and analysis of the marine water quality are placed Appendix 1. The Chuditch-2 Environmental Baseline Survey (EBS) Technical Report dated March/April 2025 conducted by WA Marine Pty Ltd trading as O2 Marine, Western Australia. The data, figures, tables and information are reproduced from that report as primary information around the Chuditch-2 Appraisal Well Program.

6.1.10 Sediment

The sediments in the Timor Sea are dominated by fine sand, silt, and clay. Sediment quality is of prime importance as an aid to understanding the possible impact of drilling activities, such as sediment resuspension or contamination from drilling waste.

Sediment quality monitoring helps identify any potential impacts caused by drilling operations, particularly the release or creation of contaminated sediments which can affect marine ecosystems (Trefry et al., 2013, Reuscher et al., 2020).

Sediment was collected and processed onboard using methods adapted from the Australian national standard for grab and box corer sampling (Przeslawski et al., 2024). At each designated grab site two sediment samples were collected using a large Van Veen grab / day grab sediment sampler, (Figure 16) with a volume of at least 7 litres (Álvarez et al., 2020) for physical, chemical and biological analysis.

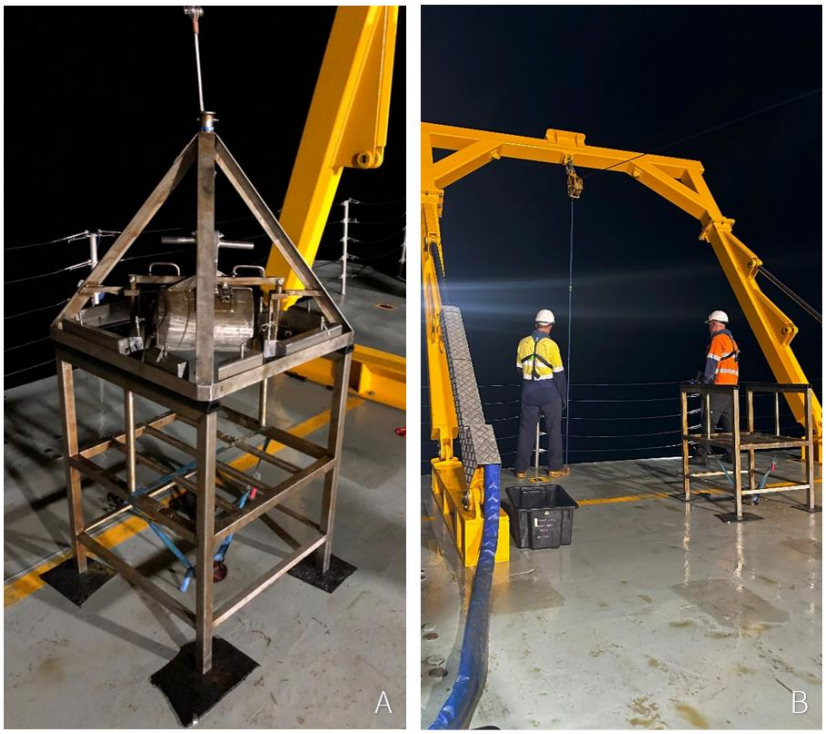


Figure 16-A) Day Grab sediment sampler positioned on retrieval point, B) Day Grab deployed overboard from vessel stern via A-Frame

From each grab, sediment was sampled for sediment quality analysis. Sediment samples was stored and transported to laboratories for the following analyses which included as

industry standards (e.g. SS-PACK-080 for Drilling Mud Exemption at Environmental Analysis Laboratory):

Sediment samples were analysed for the following parameters:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene (BTEXN);
- Total Petroleum Hydrocarbons (TPH);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Metals (Al, As, Ba, Cd, Cr, Co, Cu, Fe, Hg, Ni, Pb, & Zn);
- Oil and grease;
- Sulphur;
- Total Organic Carbon (TOC); and
- Particle Size Distribution (PSD).

The samples will be analysed at NATA-accredited laboratories in Australia.

The summary of the EBS results are:

Particle Size Distribution

Particle Size Distribution (PSD) were clay (<4 µm), silt (4-62µm), sand (62-250µm), medium sand (250-500µm), and coarse sand (500-2000µm).

Sediment PSD was generally uniform across sampling locations, where coarse grained sand (500µm-2000µm) was typically the most dominant fraction, followed by silt (4µm-62µm). Medium grained sand generally comprised the lowest fraction of grains across all sample sites, and while no sites appeared to be significantly different in their PSD composition.

Dissolved Metals

Dissolved metals results are presented summarised below.

- Gold, mercury and manganese results were reported below the LOR in all samples.
- Remaining metals (As, Ag, Ba, Cd, Co, Cu, Cr, Fe, Pb, Mn, Hg, Ni, Sb, Se, and Zn) were all generally reported at low concentrations below ANZG (2018).

Moisture

Moisture content of sediment samples ranged between 33% and 44%. The median moisture content across all sample sites was 39%, while there was a low standard deviation in % moisture content between samples (2%).

Oil and Grease

Oil and grease results was generally reported below the LOR (<500mg/kg) however was detected in low concentrations except two sites which recorder 690mg/kg and 630mg/kg.

Sulphur

Sulphur concentrations ranged between 2100mg/kg and 6100mg/kg. Median concentrations of sulphur across all samples were 3500mg/kg, while the standard deviation was 1217mg/kg.

Hydrocarbons

Results for hydrocarbons in sediments of BTEXN, Aliphatic and Aromatic Hydrocarbon, and Polyaromatic Hydrocarbon (PAH) concentrations were reported below the LOR at all sample sites.

Total recoverable hydrocarbons (TRH) were detected in low concentrations at several sample sites, normalised TRH concentrations were reported below the ANZG (2018) DGV.

The details results and analysis of the marine sediment quality are placed Appendix 2. The Chuditch-2 Environmental Baseline Survey (EBS) Technical Report dated March/April 2025 conducted by WA Marine Pty Ltd trading as O2 Marine, Western Australia. The data, figures, tables and information are reproduced from that report as primary information around the Chuditch-2 Appraisal Well Program.

6.2 Ecological Components

These components include living organisms and ecosystems which may be affected by the project. From secondary data the following description on ecological components are inferred.

Benthic communities consist of hundreds of species, yet many are sparsely distributed. As such, indicator groups are often used where the abundance or richness of one taxonomic group is used as a proxy for others (Mellin et al., 2011). Previous studies have yielded species inventories of sponges, octocorals, and polychaetes in the region and identified these groups as appropriate biological surrogates for benthic biodiversity (Wilson, 2010, Przeslawski et al., 2015, Przeslawski et al., 2019). As such, environmental baselines and monitoring around the Chuditch-2 site should focus on sponges, octocorals and polychaetes to assess conditions and detect changes in benthic communities in the Chuditch-2 region.

The grab samples from the G&G site survey were consistently similar across the area, and no live bivalves or bryozoans were recovered. Only one live sponge and one brittle star were retrieved from the samples. The high degree of easily suspended sediment and the lack of light suggest that sponge growth is low. Additionally, the drop camera work over the area showed a high similarity with single sponges present in 3 of 10 images and covering less than 5% of the field of view which were reconfirmed by the observations made during the EBS survey February 2025 and towed video footage collected by ROV in the same study.

At the regional scale, the Timor Sea is characterised by raised geomorphic features with shoals and banks which foster biodiversity levels observed due to light penetration at shallower depths and increased nutrients from ocean currents. This highlights the fact that the carbonate banks and terrace formations serve as key ecological features that promote regional biodiversity hotspots. Benthic communities can vary within these environmental attributes based on bathymetry, exposure, geochemistry, and substrate coupled with currents shaping the structure, distribution and abundance over time (Przeslawski et al., 2011, Nichol et al., 2013, Radke et al., 2015).

The Chuditch-2 site closely resembles that shown by environmental data collected by Geoscience Australia and the Australian Institute of Marine Science in Oceanic Shoals Marine Park, sampled within 45-90 meters of depth (Nichol et al., 2013). The sediments found in these terraces were typically medium to coarse-grained sand. In contrast, finer sediments were more common in deeper subdued geomorphic features (plains, valleys), and coarser sediments were more common on banks (Anderson et al., 2011). These terraces offer a significant correlation to the high biodiversity of benthic faunal groups where dense patches of sponges and octocorals (e.g. lithistids, halichondrids, and Xestospongia testudinaria) and both hard and soft substrates are profoundly intricated (Heap et al., 2010, Przeslawski et al., 2014).

During the EBS study the following ecological components include:

6.2.1 Benthic Infauna

After sediment was removed for sediment quality analysis, the remainder of the sediment sample was then processed for infauna analysis. Sediment was washed through a 1mm sieve, and the retained fraction was preserved in ethanol. The sieved fraction was then

sorted and analysed by a taxonomist to operational taxonomic unit. Taxonomic analysis occurred onshore.

Infauna can also provide an important environmental baseline for soft sediment communities, as they are important to ecosystem function and often an integral component of environmental monitoring in soft sediment habitats (Nygård et al., 2020, Schenone et al., 2023).

The three most abundant species across all sites were the bristle worm Anthuridae, the Litocorsa sp1, and the Apseudidae.

Detailed information on marine fauna including habitat and characteristics of benthic habitats and detailed information on the characteristics and abundances of the filter feeders encountered during the EBS are placed at Appendix 3.

6.2.1.1 Diversity Indices

Diversity indices are mathematical measures of species diversity and richness that provide more information about community composition than simply using raw abundance. Four indices were selected to provide information relevant to diversity, richness, and evenness. These are:

- Margalef's index (d) was selected to assess the species richness; Across the EBS survey area, the species richness index (Margalef) had the lowest value of (0.0) and the highest value of (6.636).
- Shannon's index (H) was selected to assess the species diversity; The species diversity index (Shannon-H) had the lowest value of (0.0) and the highest value of (3.086)

In general, the abundance of benthic infauna in the area of the Chuditch-2 appraisal well is low and with a sparse population of observed infaunal and epi faunal species. The area around the Chuditch-2 well is generally poor in diversity.

6.2.1.2 ROV Assessment

The benthic habitat assessment was conducted by using a Commercial ROV used for collection of benthic habitat footage (Figure 17) to collect benthic footage. Benthic imagery provides a non-destructive way to assess the habitat, organisms, and substrate at and near

the seabed. Towed imagery transects can reveal habitat boundaries and zones of impact better than drop cameras.

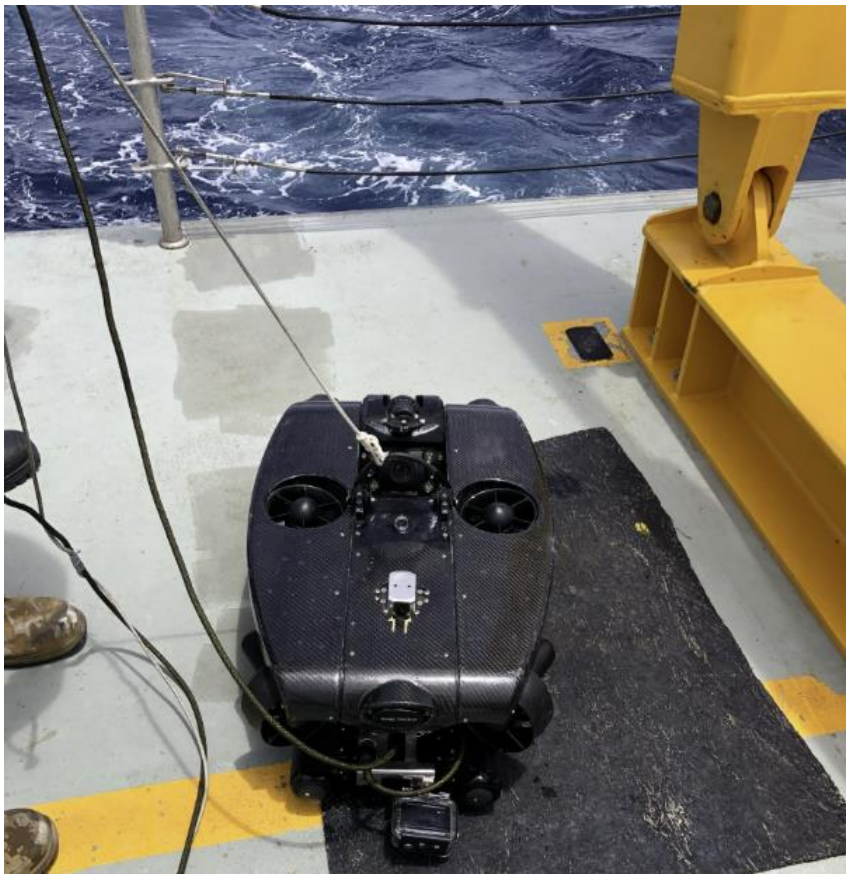


Figure 17-Commercial ROV used for collection of benthic habitat footage

Of the 4,542 classified points, 3,772 were assigned substrate information, which were largely comprised of sand / mud (59.4%), while similar proportions were assigned as rock (20.9%) and pebble / gravel – rubble (49.1%), with cobbles (0.6%) the only other substrate classification recorded.

Mixed Filter Feeders comprised 96.4% of all points assigned with dominant biota information, with Black & Octocorals (2.3%), Sponges (cup) (0.7%), Black & Octocorals - Fan (2D) (0.4%), and Sponges (mixed) (0.1%) collectively comprising the remaining 3.4%.

Information of percent cover of biota was assigned to 3,692 points, with 53.5% classified as Sparse/Low in cover. Relatively similar proportions of benthic biota cover were classified as Moderate (15.5%), Bare (14.1%), and High (12.2%), while 4.2% was classified as Dense, and 0.4% of classified points had None Recorded assigned to percent cover.

6.2.2 Marine Fauna

The Timor Sea is a biodiversity hotspot in terms of fish, marine mammals - such as dolphins and whales - in addition to sea turtles. Baseline studies recorded key species and habitats with an emphasis on the possibility of disruptions due to underwater noise/vibration, pollution, or habitat disturbance.

During the EBS study, no opportunistic marine megafauna were observed by O2 Marine field staff or Offshore Unlimited vessel crew during survey operations.

Biodiversity Hotspot: The Timor Sea is home to a wide variety of marine organisms such as fish, marine mammals like dolphins and whales, and sea turtles. These species are of ecological importance and therefore create a need for protection.

6.2.3 Marine Mammals

A wide array of whale, dolphin, and porpoise species have broad distributions, including in the Timor Sea, with some considered endangered or vulnerable due to their migratory habits. While species like humpback, and fin whales may occasionally appear in the contract area, it does not offer a unique or suitable habitat for them and therefore their movements in the area are transitory. Humpback whales' migration, calving, and resting areas are over 400 km southwest of the contract area, only occasional individuals might travel toward the Joseph Bonaparte Gulf and NT offshore waters. Blue whales, particularly the pygmy blue whale sub- species, are unlikely to be found in the contract area as the well location is far from their known migration routes and known distribution (Edyvane et al., 2024). Omura's whale may occur in the contract area based on limited data of sightings across north-western Australia and off north-east Queensland. The coastal waters of the Joseph Bonaparte Gulf and Darwin Harbour are significant areas for coastal dolphin species, such as Indo-Pacific humpback, Australian snubfin, and spotted bottlenose dolphin. However, they are less likely to be found in the deep offshore waters of the contract area. Species may occasionally venture into the Bonaparte Basin waters.

The Indo-Pacific humpback dolphin, found along the northern coast of Australia, prefers warm waters shallower than 25m and feeds on coastal-estuarine fish. Breeding occurs yearly, with births usually in spring and summer. While not known for large-scale migrations, seasonal shifts in abundance have been observed. Spotted bottlenose dolphins inhabit tropical and subtropical coastal waters, typically near shores or in shallow waters

less than 30 m deep. Their presence in the contract area, located offshore at greater depths, is likely limited due to their preference for shallower waters.

Omura's whales, a recently described species, are distributed in tropical and warm-temperate regions globally. They have been detected year-round in the Timor Sea, with more common sightings between April and September (Stacey et al., 2015). While some populations may be non-migratory, their movements across north-western Australia are still not fully understood. Given their year-round detection in the Joseph Bonaparte Gulf and across north-western Australia, Omura's whales may be encountered within the contract area and Bonaparte Basin (Pomilla et al., 2005).

In 2009, during the 2D seismic survey in the JPDA 06-101A the Marine Mammal Observer Field Report cited no cetacean sightings. However, in 2012, during the Marine Fauna Observation conducted by Minza, there were 11 cetacean sightings in block JPDA 06-101A. The G & G survey conducted in 2024 did not record any sightings of marine mammals. This could suggest that the cetaceans sighted in 2012 were migratory species, and their usual habitat was far from the contract area as the cetacean sightings between September and December were within a known migration period. In contrast, the proposed appraisal drilling in Q3 2025 is understood to be outside of the known migration period.

Due to the above factors, cetacean and mammalian observations are not expected frequently, if at all, during the period of project activities.

6.2.4 Turtles

As part of the Arafura and Timor Sea (ATS) region, the Timor Sea provides favourable biophysical and oceanographic conditions that support foraging, nesting, and migratory activities for marine species, including sea turtles. Timor-Leste, located within this region, is home to five recorded species of marine turtles: Hawksbill Turtle, Leatherback Turtle, Green Turtle, Loggerhead Turtle, and Olive Ridley Turtle. Additionally, six of the world's seven species of sea turtles can be found in the ATS region, highlighting its significance as a habitat for these endangered marine creatures (Fajariyanto et al., 2020).

Sea turtles, including Leatherback and Olive Ridley Turtles, rely on a cohesive network connected by migratory pathways influenced by oceanographic currents. While some species, like Green and Leatherback Turtles, travel globally across multiple oceans,

complete tracking data for all species is lacking. Sea turtles exhibit fidelity to their breeding sites, returning annually, which ensures the continuity of genetic stock and evolutionary lineage. Marine Protected Areas (MPAs) within the Arafura and Timor Sea (ATS) region are crucial for sea turtle conservation. Jaco Island and Tutuala Beach are known nesting sites, and other potential breeding sites may exist along the South coast of Timor-Leste or in the Northern Territories of Australia. Australia leads conservation efforts with its Recovery Plan for Marine Turtles. However, sea turtle preservation requires connectivity among multiple locations through migratory pathways and nesting beaches with more than 30% reported (Fajariyanto et al., 2020). Challenges include human activities like shipping lanes, but solutions such as cautionary protocols for passing vessels and anchor use can mitigate impacts.

6.2.5 Sharks

Sharks, belonging to the elasmobranch fish group, are characterized by a cartilaginous skeleton, visible gill slits, and pectoral fins. Species like the whale shark (Rhincodon typus), white shark (Carcharodon carcharias), and grey nurse shark (Carcharias taurus) are typical to saltwater habitats. The whale shark is prevalent in Timor-Leste waters and is considered threatened (Fish Base, 2006). The Great White Shark (Carcharodon carcharias) may transit the region and is considered vulnerable (Environment Australia, 2002). At least 49 species of sharks, including whalers, are identified within the Timor Sea region (Last & Stevens, 1994), with whale sharks occasionally transiting through the contract area although, their movements are not well understood. In 2012, one sighting of a hammerhead shark (Sphyrna sp.) was recorded in the contract area during the Marine Fauna Observation (Scope Resources, 2012).

6.2.6 Birds

Birds, while primarily land animals, rely on the ocean for their life cycles, particularly during migration. Coastal areas are crucial for roosting, nesting, and foraging, with mangrove trees providing safe roosting spots and easy access to food sources. Birdlife International has identified several Important Bird Areas (IBAs) in the ATS region, including small islands and mangrove habitats that serve as sanctuaries for seabird species.

In Timor-Leste, approximately 224 bird species exist, with 23 endemics to the Timor Island group. Among these, two are critically endangered, and three are endangered, according to

the IUCN Red List. The Christmas Island Frigate bird is the only seabird among them. Seabirds that may occur in the general area include various tern species, the silver gull, the lesser frigate bird, the common noddy, and the streaked shearwater. During the Minza 2D seismic survey in the contract area in 2009, the MMO reported a total of 10 seabirds in 6 sightings. The species recorded were Shearwaters sp., Petrel Sp. (Pterodroma Sp.), Crested tern (Sterna Bergii), Frigatebird sp, and one sighting of an unidentified seabird. In 2012, during the Marine Fauna Observation, there was one sighting of an Eastern Reef Egret (Egretta sacra). The G & G Survey does not provide specific names of bird species that might transit the area of the Chuditch-2 drilling project. With the short timeframe of drilling activities, the impact on migratory birds is considered to be insignificant.

6.2.7 Corals

The EBS study did not find any significant Corals in the vicinity of the Chuditch-2 well location.

However, several coral reefs exist in the Timor Sea, all of which perform critical functions as habitats for marine species. No soft reef systems were observed during the EBS survey in the vicinity of the Chuditch well location due to water depth, lack of light and unconsolidated sediments on the seabed. However, as reef systems might lie within the area of influence of a spill or well control event, potential impacts related to increased turbidity, sedimentation, and pollution were considered to preserve these sensitive ecosystems.

Coral Reefs at Risk in Southeast Asia Report indicate the percentage of coral reefs in good or excellent condition (live coral cover of more than 50%) in the eastern side were 45% compared to only 23% in the western side. 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.

Fringing reefs are one of the most visible types of corals in Timor-Leste. These reefs are exposed to strong coastal currents and are even found in river mouths. They contribute to high fragment levels deposited at the upper reef slope. The shallow coral reefs on the northern coast occupy an estimated area of 3,000 hectares, with potential coral habitat of over 60,000 hectares in deeper waters (Kim et al., 2022). Whilst coral species occur in

shallow coastal waters to open ocean depths of 6,000m, reef-building corals occur in less than 46m depth waters.

Corals on the northern coast of Timor-Leste include Acropora, Porites, Heliopora, Millepora, Xenia, and Briarium species. In contrast, the southern coast reefs have higher sponge, hydroid, algal, ascidian, and Montipora coral cover. Montipora colonies with black line disease and some damaged by Drupella grazing are recorded on the southern coast.

The southern coast's climatic variation, including high rainfall and lower water salinity, may affect coral distribution. However, there is limited knowledge about coral reefs in this area. Shallow waters support coral filter-feeders, while deep-water continental shelf communities lack habitat diversity but may host filter-feeding heterotrophs where hard substrate is available.

The eastern side of Timor-Leste exhibits a higher percentage of coral reefs in good or excellent condition, with 45%, compared to only 23 % on the western side, as indicated by the Timor-Leste coral reefs risk assessment (Burke et al., 2002). This study also identified several coral reefs along the Timor-Leste coast, including five distinct communities along the south coast, considered to be at medium to high risk of impact from coastal development, marine-based pollution, sedimentation, overfishing, and destructive fishing practices. These reefs include coral filter-feeders in shallow waters and continental shelf communities in deep waters. In areas with minimal seafloor topography and hard substrate, habitat diversity is limited, predominantly hosting detritus-feeding crustaceans, holothurians, and echinoderms. However, filter-feeding heterotrophs such as sponges, soft corals, and gorgonians may occur when hard substrate is available (Kim, 2021).

The G&G site survey in early 2024 indicated that at the well location's depth of approximately 68meters, live coral reefs, which typically thrive in shallower, sunlit waters, are absent. Thus, drilling operations have minimal risk of directly impacting these sensitive marine ecosystems.

6.2.8 Fisheries

The Chuditch Field is located approximately 183NM from the nearest coastline of Timor-Leste. The Chuditch-2 Appraisal well activities are restricted to a 500m declared safety zone and will not be of significance to commercial or artisanal fisheries for local communities.

Coastal communities along the 600km of Timor-Leste's coastline rely on a wide range of fish, including the large tuna species, flying fish, coral reef fish and deep-water snappers for their livelihoods.

More detailed information on fisheries is provided in the Socio-economic section in chapter 11 of this chapter.

6.2.9 Protected Areas and National Parks

Marine protected areas (MPA) and national parks that provide protection to biodiversity and importance for geo-tourism. Since the project is situated relatively near to certain MPAs, proper project planning will be carried out in order not to harm species and their natural habitats.

The MPAs, National Parks: The project area is proximal to MPAs and national parks crucial in biodiversity conservation for eco-tourism, especially geo-tourism.

Biodiversity Importance: These protected areas safeguard various ecosystems, hence protecting different species and their habitats, most of which are very sensitive to environmental changes.

The Coral Triangle, in general, is a highly biodiverse region globally, renowned as the central hub of tropical marine biodiversity. The origins of this remarkable biodiversity are attributed to the complex tectonics, evolution, and geological history of the region, along with climate fluctuations and changing sea levels. Within this Marine Park, there is the Oceanic Marine reserve (National Park) which does not permit any fishing activities ('no take' zone). The Ocean Shoals National Park is located approximately 15Km from the Chuditch-2 well location (Figure 9).

6.3 Economic Components

These components address the human economic activities and industries that could be impacted by the project. The block is located offshore, and it can marginally affect shipping and vessel movement in the vicinity of the well site. There is no tourism and recreational fishing activity near the well site. Commercial fishing activities will be restricted within the 500m safe zone around the well, although no fishing activity is expected. In nearby areas there are some oil and gas industry activities expected, in particular a seismic survey to be acquired by Eni to the north.

The impact to fishing and shipping operations caused by mobilization of the rig was assessed to be of low importance due to the offshore region and medium persistence, low intensity and low probability. Direct impacts include hazards and disruption of fisheries and vessel traffic along the mobilisation route with indirect financial impacts to industry.

Details description on economic baseline data and its impacts is presented in Chapter 11.

6.3 Social Components

Details description of social impacts in Timor-Leste, including the status of the population, living standards, health indicators, and societal structures are provided in Chapter 10. Furthermore, in the aforementioned chapter presents evaluation on the potential impacts of oil and gas exploration activities, such as the Chuditch-2 project, on employment, income levels, and infrastructure development are presented.

7. CLIMATE CHANGE

This chapter describes the relevant climate change aspects to the drilling of appraisal well operations and the decommissioning of drilling in Chuditch-2. All relevant data and information on climate in this chapter are based on the data available from the Bureau of Meteorology at Point Fawcett at Melville Island, Australia (approximately 230km from the Chuditch field) and the Arafura Timor Sea-2 project undertaken in 2021-2023. An additional source of information is from the Metocean desktop study report (March 2024) by RPS, who were employed by Sunda for the Chuditch Appraisal well project. More climate change data and trends are taken from Timor-Leste's climate risk country profile from the Asian Development Bank (ADB, 2021) and the Timor-Leste National Adaptation Plan – Addressing Climate Risk and Building Climate Resilience (2020).

Being located in the Arafura Timor Sea (ATS), this region is characterized by complex ocean-atmosphere interactions, with the Indonesian Through Flow - a vital component of the global thermohaline circulation - significantly influencing the heat and freshwater budgets of the Pacific and Indian Oceans (Hendrizan et al., 2021). The intensity and variability of the Indonesian Through Flow have far-reaching impacts on regional and global climate patterns. Intraseasonal and interannual climatic variability in the Western Indian Ocean, which includes the Arafura and Timor Seas, is driven by a complex interplay between air-sea interactions, atmosphere-ocean dynamics, and changes in climatology and oceanographic boundary conditions at various timescales (Spencer et al., 2005).

7.1 Historic Weather Observation and Trends

The Chuditch-2 appraisal well is part of the Bonaparte basin and Timor Sea region. This area experiences a tropical climate similar to mainland Timor-Leste, with distinct summer monsoonal 'wet' and 'dry' seasons. The wet season is from October to March, while the dry season is from April to September.

Meteorology and oceanography data at the fine scale of Chuditch-2 are currently deficient. Yet numerous updated and accurate data obtained at a regional scale can provide insights into the complexity of ocean-atmosphere interactions. Hence, these factors have significant implications for the regional climate, including precipitation patterns, air temperature, and the overall ecosystem health of the ATS region, where this proposed drilling site is situated.

7.1.1 Air Temperature

The air temperature data for Chuditch was obtained from the nearby meteorological station at Point Fawcett as shown in Figure 18. The recorded data shows that the air temperature varies from 27°C to 34°C in June and December, respectively.

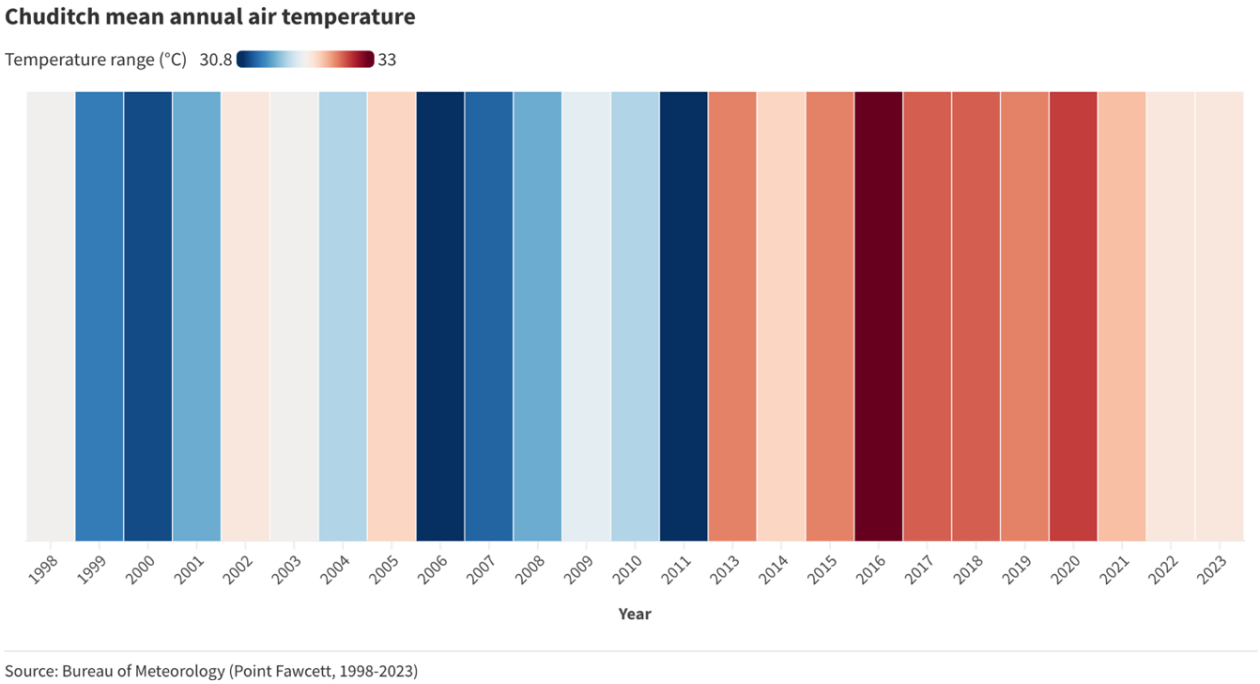


Figure 18-Trend of annual mean temperature data 1998-2023 for Chuditch Field. Adapted from the Bureau of Meteorology

The records show that the temperature, adjusted for seasonal variation, has risen slowly over the years by an average of 2 degrees since 1998. Moreover, data from USAID estimates a rise in temperature of 0.16°C per decade since 1950, and warming appears to have accelerated since the 1980s (ADB, 2021). In addition, the Arafura and Timor Seas region exhibits a uniform increase in air temperature at moderate (RCP4.5) and high emission (RCP8.5) scenarios based on the mid-century projection for 2041-2070. Specifically, Timor-Leste shows an increase in air temperature of 3.6–3.8°C by 2070 (Figure 19). Yet, air temperature in the open oceans, notably in Chuditch-2, is projected to be less significant than in coastal areas in the ATS region, including Timor-Leste, Gulf of Carpentaria and Northern Australia (Johnson et al., 2023). This may conclude that less terrestrial runoff from the south coast of Timor-Leste will not have any significant impact on onshore ecosystems such seagrass meadows, coral reefs, as well as sea turtle populations.

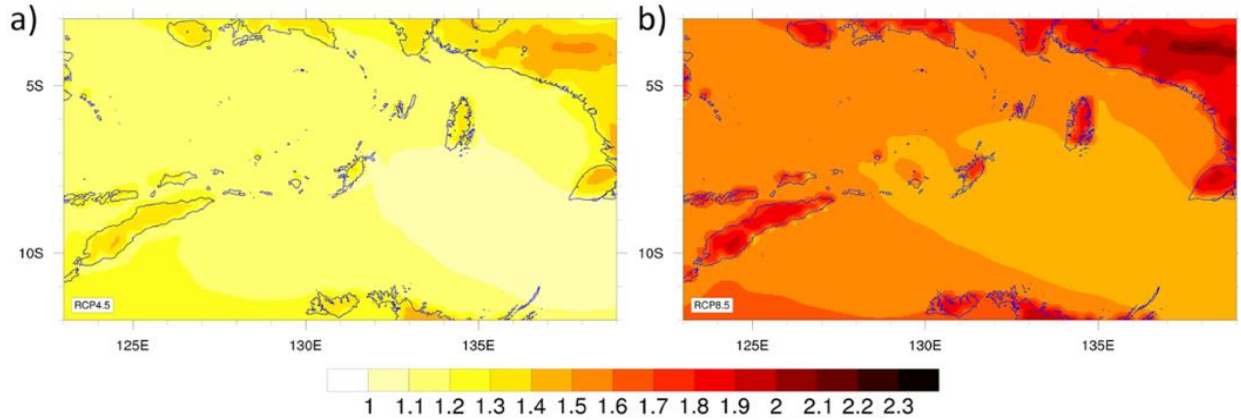


Figure 19 a and b-The projected change in mean air temperature by the 2041-2070 scenario, which ranges from 1 °C to 2.3 °C (Source: Johnson et al., 2023)

7.1.2 Sea Surface Temperature (SST) and pH

Based on the SSP5-8.5 (high emission) scenario, the sea surface temperature is expected to increase across the Timor Sea, extending into northern Australian coastal waters, the Gulf of Carpentaria, and the Indian Ocean. Under all the emission scenarios, the ocean pH (acidification) by 2070 would exhibit a net decrease across the ATS region with 0.227–0.212 units relative to 2015 (Figure 20 a and b), including the proposed Chuditch-2 drilling site (ATSEA, 2023). Thus, the impacts of both sea surface temperature and acidification combined with other non-climate drivers on the critical habitats and marine organisms are spatially variable at the regional scale yet relatively specific in terms of vulnerability drivers.

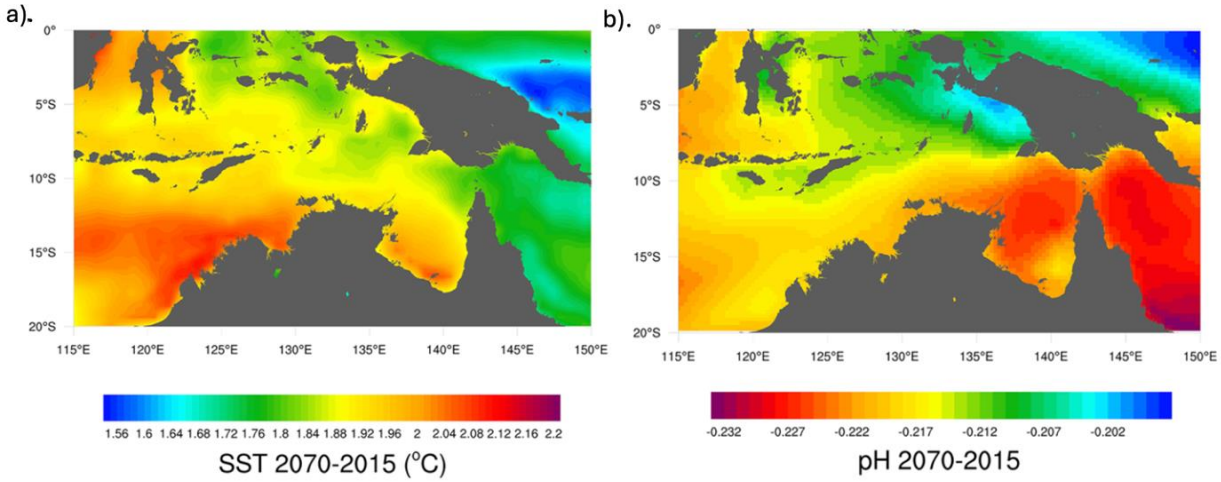


Figure 20 a and b-The sea surface temperature and pH across ATS region shows a mixed spatial pattern from 2015 to 2070 under SSP5-8.5 (high emission). (Source: ATSEA, 2023)

7.1.3 Rainfall

During 'dry' season (April to September), rainfall in the North is low to non-existent in most areas, although light showers are common closer to the coast in the southern waters of the Timor Sea.

During the wet season, the weather on the south coast of Timor-Leste is largely determined by the position of the monsoon trough, which can be in either an active or inactive phase. The active phase is usually associated with broad areas of cloud and rain, with sustained moderate to fresh north-westerly winds on the north side of the trough. Widespread heavy rainfall can result if the trough is close to or over land. An active phase occurs when the monsoon trough is temporarily weakened or retreats Northwards. It is characterised by light winds, isolated showers, and thunderstorm activity, sometimes with gusty Squall lines.

Rainfall data collected at Point Fawcett from Bureau of Meteorology (RPS, 2024) shows the mean monthly rainfall is ranging from 0.1mm (dry/winter season) to 460mm (wet/summer season). Heaviest rainfall is typically associated with tropical cyclones. These cyclones generally form south of the equator in the eastern Indian Ocean and in the Arafura and Timor Sea during wet season. In Timor Sea, most of the storms are tropical lows or tropical cyclones at an early stage of development.

7.1.4 Wave

Wave conditions around the Chuditch-2 field are determined by regional wind and ocean current systems. It normally experiences moderate wave heights of between 1.5 to 3 meters, although waves increase during the wet season from December to March, where the strengthening of monsoonal winds contributes to higher wave activity. Swells from the Indian Ocean can also influence wave conditions in the Timor Sea. Generally, the weather in this region is calm during the dry season, from April through October, with lower wave heights.

The sea state of Timor Sea comprises contributions from:

1. Indian Ocean Swell – A perennial feature of exposed Timor Sea waters. Typically, this swell arrives at the outer edge of the continental shelf from the west-southwest before refracting during propagation across the shelf, to become more north-westerly and even northerly near shore.

2. Winter easterly swell – where sufficient fetch is available (at least 200km), the synoptic winter easterlies which prevail over all of the Timor Sea, may generate an easterly or north-easterly short period swell of 6 to 10s. this swell will oppose the perennial west-south-westerly swell and can result in directional 'bimodal' sea states, which can contribute to operational difficulties for floating facilities and vessels.
3. Westerly monsoonal swell – where sufficient fetch is available (at least 200km), the prevailing summer westerly monsoon will generate a westerly or north-westerly short period swell of 6 to 10s. this swell will act to enhance the prevailing Indian ocean swell.
4. Tropical cyclone swell – will generate waves which propagate radially (roughly) out from the storm centre. Depending upon parameters such as storm size, intensity, relative location and forward speed, tropical cyclones in the Timor Sea region may generate swell of 6 to 16s period from any direction, with heights ranging up to 10m or more. Tropical cyclone swell can be expected to be more severe in the western region of the Timor Sea.
5. Local wind generated sea – typically ranges in period from 2 to 7 s but may attain 8 s under very persistent forcing. Heights are extremely variable from 0 to 4 m under non-tropical cyclone forcing, and possibly exceeding 6m (significant wave height) under severe tropical cyclone forcing. The location of local seas would be the same as the generating wind, unless local bathymetry effects (refraction, diffraction, shielding) act to influence wave direction and significant wave height.

7.1.5 Currents and Tides

Currents in the Timor Sea, including around the Chuditch field, are driven by the Indonesian Throughflow and local wind-driven circulations. ITF carries warm water from the Pacific to the Indian Ocean. This provokes a strong east-to-west current. The tidal movements around the facility are semi-diurnal with two high and two low tides each day. The tidal range around the facility is relatively small, the average spring tide approximately 1.5 meters.

Currents:

Barotropic Tide: Minimal attenuation on shelf slopes; tidal speed around 0.5m/s.

Baroclinic Tide: Occurs in areas with temperature stratification, where warmer surface water overlays cooler bottom water. Strong at continental slopes and shelf breaks (~200m depth contour).

Local Wind-Induced Currents: Generated by wind, particularly during severe tropical cyclones. Currents can exceed speeds of 1.0m/s and occasionally approach 2.0m/s.

Regional Circulation: Influenced by oceanic circulation, prevailing winds, the Indonesian Throughflow, and contributions from continental shelf waves.

High Frequency Currents: Caused by internal motion, related to the stratification of the water column and steep shelf slope bathymetry. These currents move up the continental slope and towards the shore (~100m depth).

The combination of barotropic and baroclinic tides reflects the interaction between tidal forces and temperature stratification, particularly near the shelf break. Wind-induced currents become more prominent during cyclones, with significant speeds affecting offshore operations. Regional circulation, including the Indonesian Throughflow, plays a major role in transporting warm water and nutrients. High-frequency currents impact the movement of water towards the shore, influencing marine ecosystems near the continental shelf.

Tides:

Type: Semi-diurnal (~12-hour period) and diurnal (~24-hour period), with substantial tidal amplitude.

The semi-diurnal and diurnal tides create regular variations in sea levels with significant amplitude, which are important for understanding water movement and sediment transport in the area.

7.1.6 Sea Level

In the Timor Sea, there is a secular trend of sea-level rise in the context of global trends due to climate change. Data from the last few decades shows a steady rise in sea levels at an average rate of 3mm/yr. This rise will be expected to continue, with potential implications for coastal erosion and saltwater intrusion in low-lying areas of Timor-Leste. However, the Chuditch-2 field offshore is not directly affected by projected rising sea levels.

7.2 Future Projections Under Projected Climate Change

7.2.1 Temperature

These climate change models project a significant rise in air and sea surface temperatures in the Timor Sea. Mid-century temperatures between 2041 and 2070 could increase by 1.5 to 3°C under the moderate RCP4.5 scenarios, while temperatures under the high-emission RCP8.5 could go up as high as 4°C. Such temperatures could cause changes in marine life and habitats concerning coral bleaching and the movement of species distribution.

7.2.2 Rainfall

Projections indicate that rainfall in the Timor Sea region is likely to be heavier, more variable and with a greater likelihood of extreme events. Wet season rainfall is likely to increase, and dry season rainfall decrease, with the latter being associated with greater variability. This may impact on offshore operations and terrestrial runoff is likely to have an impact on adjacent coastal ecosystems as well.

7.2.3 Wave

Climate change may increase wave heights and storm surge frequency in the future, especially during the wet season as the monsoons are stronger. Higher waves can be harmful to offshore infrastructure like drilling rigs and platforms. There is a fair probability that periods of calm during the dry season will persist, although the overall energy due to wave action can be expected to increase with increased storm frequency.

7.2.4 Currents and Tides

Changes in projected global ocean circulation patterns, including the Indonesian Throughflow, are likely to alter the speed and/or direction of the currents at present experienced in the Timor Sea. Such changes would influence sediment transport, nutrient distribution and the migration of marine species. The tidal patterns are likely to remain about the same, although local effects of sea level rise may alter tidal ranges in specific areas.

7.2.5 Sea Level

Sea level rise is likely to continue to accelerate, with a gain as high as 0.5 meters towards the end of the century under the high-emission variant scenario. This would likely result in the increased flooding and erosion of coasts along Timor-Leste but is not very likely to

directly affect the operations of the Chuditch-2 and similar wells. However, higher sea levels and storm surges might raise the vulnerability of coastal infrastructures and marine ecosystems.

7.3 Climate Implication of the Proposed Project or Environment

The table below summarizes climate implications for the project and/or the marine and coastal environments within the drilling site.

Table 18-Summary of Climate Implications

Climate Impact sources	Impact Projection Analysis	Potential Factor Impacted	Implication on Project or Environment
Temperature	• Changes in ambient temperature • Increase in sea-surface temperature • Increase evaporation • Increase humidity • Heatwaves	• Viability of ecosystem • Human Health • Agriculture • Ground and surface water • Marine Flora and Fauna	• Potential impacts on human health due to heatwaves, i.e. dehydration, fatigue • Potential increase in energy consumption due to cooling system • Acceleration of coral bleach, ocean acidification, and stress on coral reefs. • Drought effects on water storage and soil fertility
Rainfall	• Changes in rainfall patterns e.g. flooding and drought • Increase in rainfall events e.g. cyclones	• Forest Ecosystem • Coastal zone • Freshwater resource • Damage to infrastructure	• Effects on productivity due to extreme weather delays, e.g. mobilization, drilling activity
Sea-Level	• Cyclone and surges • Physical changes to coastal zones	• Coastal zone • Marine ecosystem • Marine Flora and Fauna • Seawater • Damage to offshore infrastructure	• Impacts to the physical coastal zones – inaccessible or unsafe • Increases impacts caused by cyclone-induced storm surge. • Decrease in frequency of tropical cyclone but increase in intensity. • Impacts on mangroves • Increased in saltwater intrusion.

7.4 Measures and Mitigations

Measures and Mitigation strategies will be implemented in order to reduce the climate-related risks. This involves monitoring the environmental conditions, adapting drilling and infrastructure plans to resist extreme weather events, and preserving marine life and coastal ecosystems.

The Environment Management Plan describes measures and mitigation undertaken to reduce any climate related risk and describes the roles and responsibilities of SGBU and the Drilling Contractor in preventing any climate related risk and environmental degradation.

8. ALTERNATIVES

8.1 'No Project' Alternatives

In order to test for the presence of hydrocarbon in a subsurface accumulation, a well must be drilled to intersect the formation. In the case of the PSC TL-SO-19-16 contract area, exploration commenced in 1991 and eventually leading to Shell, as operator of an earlier concession, drilling the Chuditch-1 well in 1998.

After the block was surrendered by a number of prior operators, in November 2019, SGBU signed a new PSC, TL-SO-19-16, including the Chuditch area. Under the terms of the PSC, SGBU committed to undertake petroleum exploration activities including reprocessing 3D seismic data (TGS, 2021 & 2022) and drilling of an appraisal well (Chuditch-2) within a specified time frame. Reprocessing of the seismic data was successfully completed and indicated a significant structure associated with the natural gas resources discovered with the Chuditch-1 well. Drilling of an appraisal well is required to determine the commercial viability of the discovery field. Timor-Leste, as a developing nation desires to develop its natural resources generate future export revenues and to limit the requirement to import energy resources. Accordingly, the Chuditch project is a key component of national development and there is no realistic alternative to the planned appraisal drilling campaign.

Given that there is no alternative to the project, the only viable alternatives are technical requirements for the drilling program such as well location, types of equipment (i.e. drilling rig specification), materials (i.e. drilling fluids), and techniques of waste treatment to limit impacts to the receiving environment.

No current, technically feasible alternative methodology to access and exploit the discovery field exists. Therefore, the 'No Project,' alternative is discounted on the above basis.

8.2 Well Location

Scans conducted during the geophysical study conducted in February 2024 revealed ridges and mounds in the area of an initially proposed well location. Whilst sited within a semi-arid plateau, it was considered that mounds and ridges might harbour a more diverse infaunal and benthic community than anticipated. Additionally, due to the location of the mounds and ridges that could create issues for the proper support and stability of the Rig and potential damage to spud cans.

Initially, the planned location for Chuditch-2 was 4.8km from the original Chuditch-1 well. However the geophysical site survey described above revealed that the proposed location was not suitable for a jack-up rig and led to the selection of a final location some 286m further east and about 5.1km from Chuditch-1.

The new location allows optimal location of the rig and has less probability of impact to mounds and ridges in the vicinity. The new Chuditch-2 location has a flatter seabed than the original proposed location as shown the bathymetry map in Figure 21.

Other viable locations did not meet the technical requirement for the drilling program to locate the well at or near a target area of the gas reservoir. Options for the wellsite are constrained to within a short distance depending on the subsurface target. Another change in location is as likely to cause a similar impact to the receiving environment as is the current chosen location and there is no environmentally persuasive reason for a further change in location. In addition, any change to location might lead to a requirement for an inclined trajectory of the well to reach the prognosed target, materially impact the cost of the well and introducing some operational risk. As the well is expected to confirm the available reserves as commercially viable, under terms of the PSC, all costs incurred are cost recoverable. Accordingly, SGBU seek to limit the economic burden associated in well design and execution to Timor-Leste.

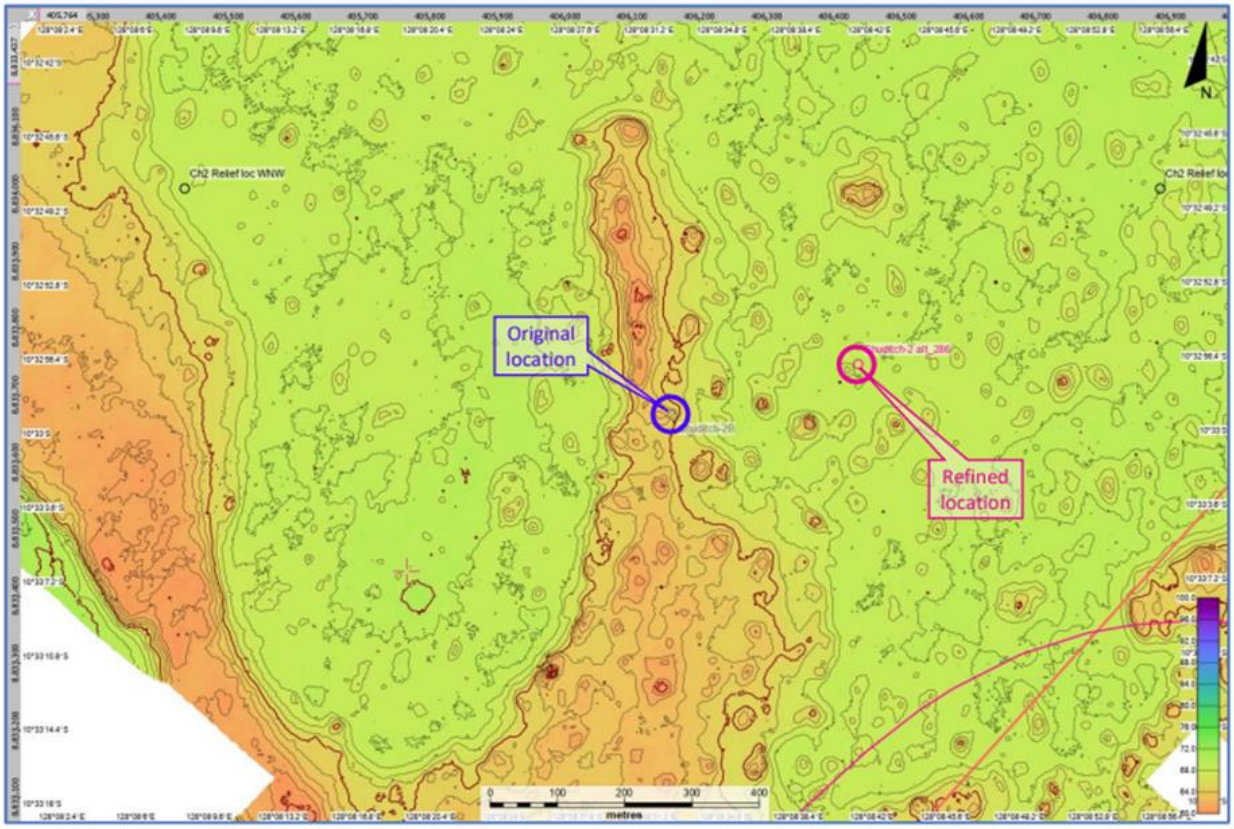


Figure 21-Bathymetry of original location and refined location for Chuditch-2 from Geophysical Site Survey. (Source: RPS, 2024)

8.3 Well Design

The Chuditch-2 well is a vertical design and is the most technically simple and cost-effective method of drilling to target a reservoir and testing with a less complex requirement for evaluation (e.g., wireline logging versus LWD or pipe conveyed shuttle). Given the geology profile of Chuditch-2 which is similar to Chuditch-1, it has been decided that vertical drilling will be employed for this project as shown in Figure 22.

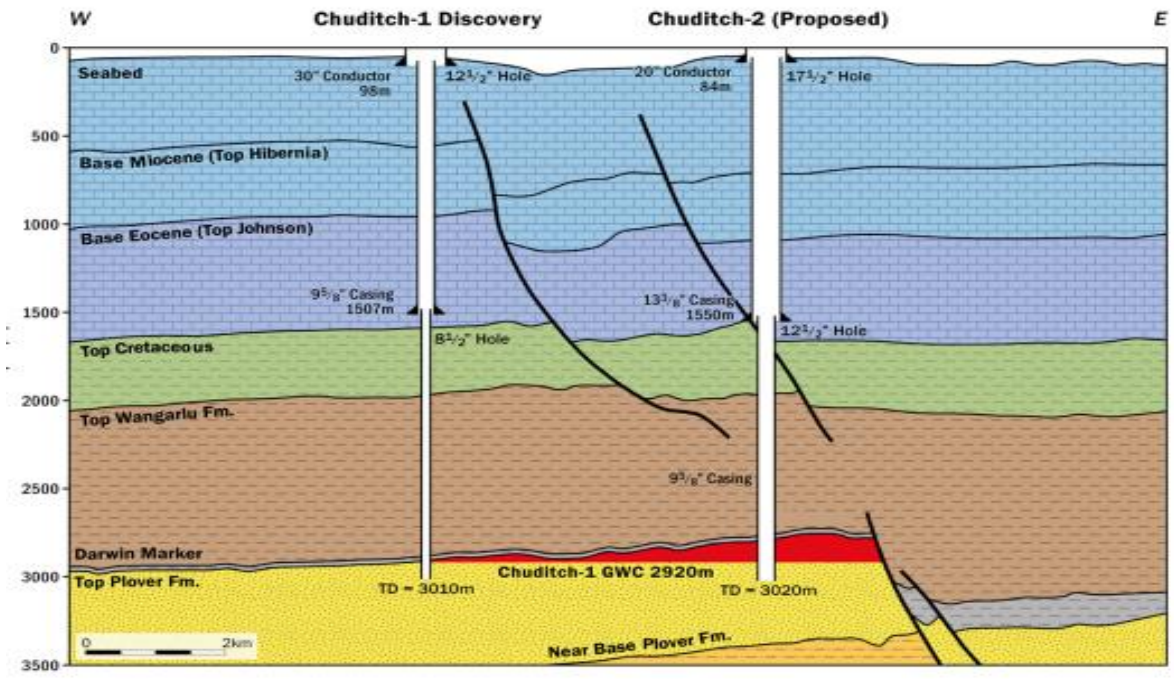


Figure 22-Well Design for Chuditch-2 Appraisal Well alongside with Chuditch-1 Discovery Well.

8.4 Drilling Fluids

Drilling fluids provide a hydrostatic column of weighted fluid which balances down hole pressure and facilitates cuttings removal from the well bore, contributing to bit longevity and efficiency and are recirculated between the bottom of the well and the MODU continuously in a closed system during drilling under the supervision of the Mud Engineer who tests and adjusts the mud, through chemical addition, as required for correct properties including density. When drilling reaches well TD, the MODU continues to circulate drilling fluids to condition the well by circulating the mud, 'bottoms up" to assist in well clean up, monitoring the mud flow across the shaker screens to gauge particle sizes over the screens. Following open hole wireline logging and installation of the production casing the well is conditioned/cleaned and displaced to either Calcium or Sodium Chloride and the SBM is stored in mud tanks on the MODU for ultimate discharge to supply vessels and return to vendor.

Factors to be considered when choosing drilling fluids:

- Well design
- Formation pressure
- Rock mechanics

- Chemistry of the formation
- Limiting negative impacts on the producing formation
- Environmental issues and regulations
- Logistics
- Cost

8.4.1 Consideration of Water-Based Drilling Fluid (WBDF) V Non-Aqueous Drilling Fluid (NADF)

According to Ahmed & Kalkan (2019) water-based drilling fluids (WBDFs) are the fluids of choice for drilling applications because of their cost-effective, environmentally friendly and non-hazardous nature. The waste discharge from WBM can be disposed onsite with minimal environmental affect, hence, there is no expense for cutting treatment before disposal.

However, WBM's are ineffective when dealing with water-sensitive shale and reactive clays which can lead to shale hydration and swelling clays in the well bore, compromising wellbore stability and increasing the potential for the drill string to become stuck in hole with an increase in project cost proportionate to the time lost in freeing the drill string, cost of the drill string loss and side track.

An analysis of offset wells near Chuditch-2 indicated major operational problems associated with drilling the Wangarlu formation. Issues reported included tight hole, bit balling and pack-offs which SGBU attribute to water-based mud design. Consequently, SGBU have decided to use Saraline 185V NADF in drilling the Wangarlu formation. WBM will be used to drill the 17½" section of the well.

Oil-based fluids/muds (OBMs) formulated with diesel, mineral oil, or low-toxicity linear olefins and paraffins are less environmentally considerate than Saraline 185V and have not been considered due to inferior environmental performance.

9. IMPACT ASSESSMENT AND MITIGATION MEASURES

9.1 Introduction

SGBU maintains a comprehensive, integrated system which includes standards and procedures necessary for the management of Health Safety and Environment (HSE) risks. The SGBU HSE Policy sets the direction and minimum expectations for environmental performance and is implemented through the standards and procedures of the SGBU Safety Management System.

The potential environmental impacts associated with the proposed appraisal drilling activities and the corresponding mitigation measures are discussed below. The assessment is limited to the current drilling project and does not extend to future petroleum development.

9.2 Methodology and Approach

An Environmental Impact Assessment (EIA) was conducted, and mitigation for air quality, marine pollution, and ecological disturbance was made.

The EIA is conducted in three stages:

1. Identification of potential impacts;
2. Evaluation of the significance of potential impacts; and
3. Classification and prioritizing.

Identification of potential impacts aims to determine all impacts that may arise due to interactions between the project activities and environmental components.

The likely effects of each project activity on the environment is identified and described. Direct, indirect, short, medium and long term, positive and negative effects shall be covered. The assessment will then focus on key issues, a process referred to as scoping. The scale and significance of potential impacts shall be predicted.

Once the impacts have been identified and their scale assessed then the significance of the effects on the environment are evaluated. This usually involves reference to accepted criteria or standards for health, nuisance, or acceptability in general. For impacts such as noise and atmospheric emissions such as particulates, acceptable standards are widely recognised, for example in IFC Guidance (IFC, 2007a). ANZECC and ARMCANZ (2000) guidelines will be used to evaluate the marine water quality, sediment quality, and toxicants from the proposed project. For other impacts such social, economic, and cultural, the

assessment will be based on agreed professional subjective judgement and acceptability related to current social and cultural factors and not to any scientific analysis.

The measured impact and assessment of its significance will usually indicate the need for measures to mitigate harmful effects. Such measures may involve specification of equipment performance; preparation of policies and procedures; alternative technologies; limited options regarding location of the drilling site; use of alternative chemicals or materials; waste recovery; and contingency planning.

The following were considered when establishing the acceptable levels of impacts and risks:

- The principles of Ecologically Sustainable Development (ESD);
- Other requirements applicable to the Chuditch-2 project (e.g., laws, policies, standards, conventions etc.);
- Significant impacts to the Marine Environment; and
- Internal context.

Principles of Ecologically Sustainable Development (ESD)

SGBU has considered the principles of ESD in defining acceptable levels of impacts and risks.

The principles of ESD are summarised as:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social, and equitable considerations.
- Precautionary principle – if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- The principles of inter-generational equity – that the present generation should ensure that the health, diversity, and productivity of the environment is maintained or enhanced for the benefit of future generations.
- The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.

Other Relevant Requirements

SGBU considered other relevant requirements that apply to the environmental management of petroleum activities, including legislation, policies, standards, and guidelines in establishing acceptable levels of impacts and risks.

The TOR forms the basis for the assessment of the Chuditch-2 project, the scope of work and potential impacts, SGBU has given specific attention to the acceptability of impacts and risks to the marine environment.

Where a potential interaction between any relevant impact and an aspect of the petroleum activities covered by this EIS was identified, the criteria provided are listed in Table 19.

Significant impacts to the Marine Environment

Potential impacts and risks to the environment from aspects of petroleum activities were deemed inherently acceptable if:

- The significant impact criteria in relation to the environment are not anticipated to be exceeded.
- The management of the aspect is aligned with published guidance material, including the Australian Department of Agriculture, Fisheries and Forestry (DAFF) (as the leading best practice standard), including threat abatement plans, recovery plans and conservation advice.

Internal Context

The following outlines SGBU internal impact and risk assessment defined acceptable levels:

- Residual planned impacts that are ranked as minor or less (i.e., minor, negligible, no effect or positive effect) and residual risks for unplanned events ranked yellow, light blue or green, are inherently 'acceptable', if they meet legislative and SGBU requirements and the established acceptable levels of impacts and risks.
- Moderate residual impacts, and yellow residual risks, are 'acceptable' with appropriate controls in place and if good industry practice can be demonstrated.
- Major and massive residual impacts from planned activities, and red residual risks from unplanned activities, are 'unacceptable'. The activity (or element thereof) should not be undertaken as the impact or risk is serious and does not meet the principles of ESD, legal requirements, SGBU requirements or regulator and stakeholder expectations. The activity requires further assessment to reduce the risk to an acceptable level.

Table 19 provides a summary of the acceptability statements. With the EBS conducted in February 2025, a multidisciplinary team of SGBU were able to assess potential impacts and consequences in the EIS process.

Table 19-Acceptability Categories

Acceptability Statement	Residual Impact (planned)	Residual Risk (Unplanned)
Inherently acceptable - Manage for continuous improvement through effective implementation of the HSSE and SP management system	Positive Impact Consequence	Green
	No Impact Consequence	Light Blue
	Negligible Impact Consequence	Light Blue
	Minor Impact Consequence	Yellow
Acceptable with controls - Apply the hierarchy of control to reduce the risks to ALARP	Moderate Impact Consequence	Orange
Unacceptable	Major Impact Consequence Massive Impact Consequence	Red

9.2.1 Type of Impacts and Definitions

An impact refers to any alteration to a resource or receptor resulting from a project component or related activity. Baseline data evaluation is vital as it offers essential information for assessing and describing the potential effects of the project on the biophysical and socio-economic environment. The impact nature and type are given in Table 20.

Table 20-Impact Nature and Type

Nature or Type	Definition
Positive	Impact that is of benefit to the receiving environment
Neutral	Impact that has No Cost or benefit to the receiving environment
Negative	Impact that is considered to represent an adverse change or introduces a new undesirable factor; A cost to the receiving environment
Direct	Impact that results from a direct interaction between a planned project activity and the receiving environment
Indirect	Impact that results from other activities that are encouraged to happen as a consequence of the project activity
Cumulative	Impact that results from the sum of several insignificant effects to the environment, however when accumulated can cause significant impact to the environment
Cross-border	Impact that results from the proposed project to the environment beyond the contract area and/or project boundary
Global	Impact that results from the proposed project which can affect the wider ecology i.e. climate change.

9.2.2 Characterization of Impacts

Predicting impacts involves subjective assessments based on qualitative or semi-quantitative methods to anticipate the environmental consequences of the drilling project. To determine the significance of these impacts, it's crucial to first describe their character, nature, and type comprehensively.

The criteria used to describe impact characteristics are detailed in the Table 21 and Table 22 below, and are summarised as follows:

- Extent: The spatial scale of the impact (i.e., site-specific, local, regional, national and or international).
- Duration: the temporal scale of the impact, the time period over which the effect will last (i.e., short-term, medium-term, long-term, permanent).
- Intensity - environment: sensitivity, resilience and/or ability to function.
- Intensity – social and economic: number of people affected by the project.
- Likelihood: the frequency/probability of impact or how often it might occur (i.e., not probable, probable, highly probable, definite).

Table 21-Characterisation of Impact, Its Criteria and Ranking

CHARACTERI-SATION OF IMPACT	EVALUATION CRITERIA	RANKING
EXTENT	**Site-Specific:** Impact that are limited to the boundaries of the project site	1
	Local: Impacts that extends beyond the site boundary; affects the immediate surrounding environment (i.e., up to 5km from Project Site Boundary)	2
	Regional: Impact that extends far beyond the site boundary; widespread effect (i.e., 5km and more from the Project Site Boundary)	3
	National and/or international: Impact that extends far beyond the site boundary; widespread effect	4
DURATION	**Short-term:** Impact that is quickly reversible; 0-5 years	1
	Medium term: Impact that is reversible over time; 5-15 years	2
	Long-term: Impact that lasts 16-30 years	3
	Permanent: Impacts that last over 30 years and resulting in a permanent and lasting change that will remain	4
INTENSITY -	**None:** The impact on the environment is not detectable	1

CHARACTERI-SATION OF IMPACT	EVALUATION CRITERIA	RANKING
ENVIRONMENT	**Low:** Low value. The impact affects the environment in such a way that natural functions and processes are not affected	2
	Medium: Moderate value. Where the affected environment is altered but natural functions and processes continue, albeit in a modified way	3
	High: High value. Where natural functions or processes are altered to the extent that they will temporary or permanently cease. Where the affected environment is permanently altered	4
INTENSITY OR NUMBER OF ELEMENTS - SOCIAL, AND ECONOMIC	**None:** Affecting a small number of Individuals/households, or communities.	1
	Low: Affecting a small number of Individuals/households, or communities.	2
	Medium: Affecting more Individuals/households, or communities.	3
	High: Affecting a large number of Individuals/households, communities	4

Table 22-Timescale of Impact and Its Likelihood

IMPACT	TIME SCALE OF IMPACT - LIKELIHOOD	RANKING
LIKELIHOOD	**Improbable:** Possibility of the impact materializing is negligible; chance of occurrence <10%	1
	Probable: Possibility that the impact will materialize is likely; chance of occurrence 10-49%	2
	Highly Probable: It is expected that the impact will occur, chance of occurrence 50-90%	3
	Definite: Impact will occur regardless of any prevention measures, chance of occurrence >90%	4

9.2.3 Impact Significance

The impact significance can be calculated by multiplying the likelihood of the impact and the total environmental impact (Impact Significance = Likelihood x Total Environmental Impact).

The total environmental impact can be obtained by accumulating or adding all four impact categories (i.e., Extension, duration, Intensity Environment and the Intensity Socioeconomic) according to their rankings. The Total Environmental Impact will then be multiplied by the likelihood to obtain the Impact Significance as shown in the Table 23.

Table 23-Risk Matrix

Scenarios[1]	Extension (Ranking)	Duration (Ranking)	Intensity-Environment (Ranking)	Social and Economic (Ranking)	Total Env. Impact	Impact Significance (= Likelihood x Total Env Impact)			
						1	2	3	4
1	Site-Specific (1)	Short (1)	None (1)	None (1)	4	4	8	12	16
2	Local (2)	Medium (2)	Low (2)	Low (2)	8	8	16	24	32
3	Regional (3)	Long (3)	Medium (3)	Medium (3)	12	12	24	36	48
4	National/International (4)	Permanent (4)	High (4)	High (4)	16	16	32	48	64

[1] Please note that we only provide four scenarios as examples. Other scenarios could be calculated according to the ranking of each impact category.

A multi-disciplinary team consisting of SGBU drilling manager, HSE manager, well controls manager and jack-up rig HSE team and Drilling Manager with the EIS consultants discussed the environmental impacts of drilling operations and identified the hazards, the sources and deliberated as Chuditch-2 well is a gas well and classified the inherent environmental risk.

The summary of inherent risk in absence of risk mitigation measures of Chuditch-2 Appraisal Drilling project to the environment is given Table 24.

Table 24-Summary of Chuditch-2 Appraisal Drilling Inherent Environmental Risk

Hazard	Source	Inherent Risk
Atmospheric emissions (SOx/NOx and greenhouse gases)	● Power generation for the drilling rig. ● Fuel transfer activities, including emissions from machinery, fugitive emissions from unsealed containers, maintenance operations, equipment testing, and small-scale engineering works. ● Vessel propulsion and onboard power generation and fugitive emissions from machinery on rigs and vessels. ● Potential leakage and spillage incidents, particularly in cases of poor management practices. ● Fugitive emissions from loading operations and tank storage activities, ● Flaring during well testing, no significant impacts are anticipated, as only Drill Stem Testing (DST) will be conducted for a limited duration. ● Transportation activities, including increased flights and vehicle traffic. ● Manufacturing processes related to drilling operations, such as the production of drilling muds, chemicals and machinery.	Medium
Uncontrolled release from well (Gas and associated Condensate)	● Well releases ● Well blow-out	High
Drilling Discharges (WBM)	● Discharge of WBM contaminated drill cuttings and associated discharge of WBM drilling fluid and muds.	Low
Drilling discharges (SBM)	● Discharge of SBM will not be discharged directly to the sea. ● Onshore discharge of bulk SBM drilling muds at the completion of drilling.	Medium

Hazard	Source	Inherent Risk
Oil, fuel and chemical spills	● Vessel collision ● Fuel or chemical transfers ● Leak from fittings and connections ● Hydraulic fluid leaks	Low
Solid and hazardous wastes	● Potential escape of solid and hazardous wastes (e.g. waste oil, chemicals) from operating vessels. ● General non-hazardous wastes; Domestic waste generation, including paper, wood, pallets, cardboard, scrap metal, and packaging materials. ● Hazardous wastes include recovered solvents, excess or spent chemicals, oil contaminated materials. ● Maintenance wastes, include used chemicals, lubricating oils, paint, solvents, rags and other cleaning items.	Medium
Deck drainage	Deck drainage and associated contaminants from operating vessels.	Low
Laboratory wastes	Laboratory wastes generated during oil testing	Low
Cooling water	Discharge of cooling water and associated chemical additives from operating vessels.	Low
Desalination brine	Discharge of reject water (brine) from reverse osmosis plants from operating vessels.	Low
Sewage, domestic wastewater and putrescible wastes	Discharge of sewage, domestic wastewater and putrescible wastes from operating vessels.	Low
Antifouling biocides	Hull antifouling on operating vessels	Low
Ballast Water and Marine pests	Ballast water discharge Hull biofouling	Low
Physical disturbance to marine biota	Physical presence of operating vessels	Low
Noise and vibration disturbance to marine biota	Noise and vibration generated from aircraft during crew changes	Low

Hazard	Source	Inherent Risk
Disturbance to marine biota from artificial lighting	Lighting from operating vessels	Low
Social, Economic and Cultural	• Employment • Economic development • Public Complaints	Medium

9.3 Environmental Impacts of Appraisal Drilling Program

Based on potential impacts of the appraisal drilling program discussed above, acceptability categories, impact nature and type, the characterization of impact, its criteria, its likelihood and risk ranking the environmental impacts are considered.

The key potential environmental impacts of the appraisal drilling program include:

- Air emissions
- Discharges to marine waters and disturbances to marine ecology
- Physical presence of drilling infrastructure
- Waste generation
- Socio-economic effects
- Occupational health and safety risks
- Additional impacts, including vessel movements, oceanographic changes, and other related factors.

9.3.1 Source of Emissions to Air

Air emissions from the proposed appraisal drilling activities are expected to originate from both primary and secondary sources.

Primary sources primarily consist of direct emissions associated with appraisal drilling activities, including:

- Power generation for the drilling rig,
- Fuel transfer activities, including emissions from machinery, fugitive emissions from unsealed containers, maintenance operations, equipment testing, and small-scale engineering works,
- Vessel propulsion and onboard power generation and fugitive emissions from machinery on rigs and vessels,

- Potential leakage and spillage incidents, particularly in cases of poor management practices,
- Fugitive emissions from loading operations and tank storage activities,
- Flaring during well testing, no significant impacts are anticipated, as DST will only be conducted for a limited duration.

Secondary sources are emissions from associated activities that are required that support the appraisal drilling such as:

- Transportation activities, including increased flights and vehicle traffic
- Manufacturing processes related to drilling operations, such as the production of drilling muds, chemicals, and machinery.

Atmospheric emissions, including greenhouse gases (GHGs) such as carbon dioxide (CO_2) and methane (CH_4), as well as non-GHG pollutants like sulphur dioxide (SO_2) and nitrogen oxides (NO_x), are generated from diesel-fuelled internal combustion engines used for power generation on the jack-up rig, as well as for power generation, propulsion, and on supply and standby vessels. However, due to the prevailing meteorological conditions, including rapid dispersion and dilution by wind, these emissions are assessed to be of low significance.

The Environmental Management Practices Monitoring will be conducted to collect and analyse fuel usage data from all sources during the appraisal drilling well activity.

This assessment focuses on evaluating the emissions generated from sources associated with the following activities:

9.3.1.1 Transportation

Diesel will be the main fuel sources used by the 2 supply vessels employed for the drilling and associated activities. Fuel consumption estimates for the Chuditch-2 appraisal well drilling at a distance of approximately 250km from land, taking an average of 10m³/day/vessel (10x44x2 = 880m³) so the total fuel diesel consumption is estimated to be approximately 880m^3 for the vessel transportation directly associated with the drilling activities. This transport will include towing of MODU to the drilling site, standby vessel duties and support vessels from logistic points to the drilling site.

In addition, based on an estimation of five crew changes on a weekly basis, a total of 30 crew changes could be expected from the entire drilling program. An estimated 54.5m³ of jet fuel consumption is predicted from the helicopter transfer for the crew change.

9.3.1.2 Drilling

Power supply on the jack-up rig will be provided by a diesel generator set. Additionally, most drilling and associated machinery will be powered by diesel combustion. The consumption of diesel during drilling activities will result in the emission of combustion gases, smoke, and particulate matter.

Based on the estimated operational time for appraisal well, diesel consumption for the appraisal drilling well (18m³x44days) is projected to be approximately 792m³.

9.3.1.3 Well Testing

For the majority of appraisal drilling well testing activities, air emissions are primarily generated from gas flaring during well testing operations. Flaring emissions typically result in elevated levels of non-methane volatile organic compounds (VOCs), methane (CH_4), sulphur oxides (SO_x), nitrogen oxides (NO_x), and carbon monoxide (CO).

However, for this appraisal drilling well, flaring will be conducted for a period during the DST limited to approximately 30 hours total. Estimated volumes of flaring during the well testing period is given in Table 4 which provides estimated flow periods and produced volumes which is 36.67mmscf. The GHG emissions from well testing is given Table 28

The condensate volume is about 146.67bbl and would direct to a separator/surge tank, designed to function as storage/separation unit for produced liquids and gases until flared. The Chuditch-2 well, 3 clean-ups flow are programmed for produced gases, fluids including produced water which will be redirected to the test separator where bulk fluids are separated into oil (if present), condensate, gas and water. The separator will also facilitate the separation of any debris, such as sand and other material from the flow.

9.3.1.4 Greenhouse Gas (GHG) Emissions

Greenhouse gas (GHG) emissions from Helicopter operation

Table 25-GHG emission summary from Helicopter operation for Appraisal Drilling Activity

Parameter	Value
Heli-Trip Estimation	
Estimated Crew Change	5 per week
Total Drilling Days	42 days (6 weeks)
Total Crew Change	6 weeks × 5 times/week = **30 trips**
Heli Operation Hour Estimation	
One-way Distance per Trip	~500 km (~2 hours at 250-300 km/h)
Return Trip Distance	1,000 km (~4 hours)
Total Heli Operation Hours	4 hours × 30 trips = **120 hours**
Type of Helicopter Used	
EC 155B1 Fuel Consumption	95 gal/hr
AW 139 Fuel Consumption	129 gal/hr
EC 225 Fuel Consumption	183 gal/hr
S-76C+ Fuel Consumption	90 gal/hr
S92 Fuel Consumption	178 gal/hr
Average Fuel Consumption Assumed	**120 gal/hr**
Total Fuel Consumption	120 hrs × 120 gal/hr = 14,400 **gal**
Fuel in Liters	14,400 gal = 54.510 **m³ or 54,510 L**
Jet Fuel Energy Value	36.8 MJ/L
Total Energy	54,510 L × 36.8 MJ/L = **2,005,968 MJ (2006 GJ)**
CO_2 Emission Factor for Jet Fuel	73.1 kg/GJ
Total CO_2 Emissions	2,006 GJ × 73.1 kg/GJ =**146,639 kg (146 MT CO_2eq)**

GHG emission from Fuel Oil Consumption

Table 26-GHG emissions from Fuel Oil Consumption for Appraisal Drilling Activity

Parameter	Value
Total Fuel Oil Consumption	
Supply/Standby Vessel	**880 m³ (880,000 L)**
MODU & Drilling Activities	**792 m³ (792,000 L)**
Total Fuel Oil Consumption	1,672 m³ = **1,672,000 L**
Marine Diesel Energy Value	38.6 MJ/L
Total Energy	1,672,000 L × 38.6 MJ/L = **64,539,200 MJ (64,539.2 or 64,539 GJ)**
CO_2 Emission Factor for Marine Diesel	74.9 kg/GJ
Total CO_2 Emissions	64,539 GJ × 74.9 kg/GJ = **4,834,000 kg (4,834 MT CO_2eq)**

References: Review of Offshore Helicopter Operations in Australia for NOPSA, 2007. U.S. Forest Service - Fire Contracting. Australia Institute of Energy – Energy Values for Greenhouse Emission Factor.

9.3.2 Impact Assessment

The primary atmospheric emissions associated with the proposed appraisal drilling activities include carbon dioxide (CO_2), methane (CH_4), nitrogen oxides (NO_x), and volatile organic compounds (VOCs). Additionally, sulphur dioxide (SO_2) and hydrogen sulphide (H_2S) may be present, depending on the sulphur content in the hydrocarbon or fuel used for combustion in power generation. Among these, CO_2 and CH_4 are key greenhouse gases (GHGs) contributing to climate change.

Based on the estimated fuel consumption of 1,672m³ of diesel, 54.5m³ of jet fuel and 36.67mmscf of natural gas flaring for the proposed appraisal drilling program, the total GHG emissions are projected to be approximately 6, metric tonnes (MT) of CO_2-equivalent (CO_2-eq). While this emission volume is negligible compared to the global CO_2 emissions of approximately 37.29 billion MT recorded by Our World in Data, it nonetheless contributes, minimally, to global warming. A summary of Environmental Impacts of different Atmospheric Releases are given in Table 27.

Table 27-Environmental Impacts of Different Atmospheric Releases

Type of Emission	Environmental Impact
Carbon Dioxide (CO_2)	A GHG that is believed to contribute to climate change.
Methane (CH_4)	Enhances low level ozone production, indirectly contributing to climate change.
Carbon Monoxide (CO)	Enhances low level ozone production, indirectly contributing to climate change.
Oxides of Nitrogen (NO_X)	Contributes to acid deposition (e.g. acid rain). May also enhance ground level ozone when mixed with VOCs in sunlight.
Sulphur Dioxide (SO_2)	Contributes to acid deposition (e.g. acid rain). Toxic gas.
Volatile organic compounds (VOCs)	A range of potential impacts, for example hydrocarbons may promote formation of photochemical oxidants. May also be known or suspected carcinogens.

Table 28-CO_2-eq Estimation for Direct Emission from the Proposed Appraisal Drilling Programme

Source	Fuel	Fuel Consumption (m^3)	Energy Value	CO2-eq Emission Factor	Estimated CO2-eq Emission (MT)
Rig/ MODU Vessel	Diesel	792m^3 880m^3	38.6 MJ/L	74.9 kg/GJ	4,834 MT
Helicopter	Jet fuel	54.5m^3	36.8 MJ/L	73.1 kg/GJ	146 MT
Well Testing and Flaring	Natural Gas	36.67mmscf	53.96kg CO_2/mmBTU	1mmscf of natural gas ≈ 1,037 mmBTU	2,013 MT
Total					**6,993 MT**

9.3.3 Mitigation Measures

The overall impact of air emissions from the proposed appraisal drilling activities is anticipated to be insignificant, provided that appropriate mitigation measures are implemented. This assessment considers the high dispersion and dilution effects of meteorological conditions at the project site, as well as its remote location, which is far from any sensitive receptors.

Mitigation measures to minimize air emission impacts include:

- Regular maintenance of engines, compressors, and generators to ensure optimal performance.
- Installation of advanced combustion technologies, such as dry low-NOx combustion systems.
- Enhancement of fuel injection systems and pre-combustion processes in diesel engines to reduce NOx emissions.
- Routine inspection and maintenance of helicopters and support vessels.
- Optimization of fuel efficiency and minimization of emissions from fired machinery through the use of low-sulphur-content fuels.
- Implementation of strict operational controls and high standards of housekeeping.
- Careful management of the flare gas mix during well testing, if full well testing is conducted.
- Utilization of high-efficiency flare burner designs should flaring be required.
- Exhaust gases from diesel-driven power generators, including SO_2, NOx, and CO, will be released into the atmosphere through stacks of appropriate heights to facilitate dispersion.

As a result, the impact of these gaseous pollutants on ambient air quality is expected to be negligible. Furthermore, the appraisal drilling site is located approximately 340 linear km from Darwin and 280km from the east coast of Timor-Leste ensuring that any emissions from diesel generators will have a minimal impact on the onshore environment. Given the remote location of the planned appraisal drilling activities and the low likelihood of unplanned events, the anticipated social, economic, and cultural impacts are expected to be minimal.

9.4 Discharge to Marine Water and Marine Ecological Disturbance

9.4.1 Sources of Potential Discharges

Potential discharges into the receiving marine waters may arise from various sources, including the disposal of drilling mud and cuttings, oil, fuel and chemical spills, laboratory wastes, cooling water, ballast water discharge, deck drainage, solid and hazardous waste, sewage, grey water, domestic waste, and food scraps.

9.4.2 Impact Assessment

Rig placement and drilling activities have the potential to disturb sediments within the water column, leading to increased TSS and turbidity, which may affect benthic organisms. Sediment disturbance can result in the smothering of benthic communities, potentially altering their structure. Previous studies conducted at offshore sites suggest that appraisal well drilling activities may cause short-term reductions in the abundance of benthic organisms. Many of these benthic species serve as a food source for juvenile prawns and other commercially and recreationally important fish species that inhabit deep-sea sediments. However, as the well location is situated far from commercial and recreational fishing areas and the drilling duration is limited, any sediment disturbance is expected to be temporary and likely to have a transient impact on benthic organisms who will recover rapidly.

Drilling activities and the associated re-suspension of sediments (turbidity) may result in localized, short-term changes to the benthic environment, potentially displacing benthic organisms such as prawns from the affected area. While the abundance of benthic fauna within the well drilling site, particularly in areas influenced by the deposition of fine muds and sands, may decline immediately after drilling, the overall impact will be minimal given the availability of similar habitats in the broader area. It is well established that benthic communities have the capacity to recover both between and after periods of disturbance. The currents near benthos also create re-suspension of sediments and any turbidity near drilling location would be dispersed naturally to background levels except the drill cuttings which have limited effect of the fauna at the localized area.

9.4.3 Marine Ecological

- Conduct inspections and monitoring for biofouling on vessel hulls, equipment, and machinery before departure from port to PSC-TL-SO-19-16 as per relevant regulations.
- Consider seabed stabilization techniques to minimize sediment disturbance and benthic habitat impacts.
- Follow standard procedures for anchoring, deployment, and retrieval to prevent anchor damage, chain drag on seabed sediments, and unnecessary disturbance to benthic organisms.

9.5 Hydrocarbon Spills

9.5.1 Source of Hydrocarbon Spills

Oil spills are the most significant potential threat to the environment from drilling projects. Oil spills can potentially occur from a number of sources ranging from a major spill, such as a well blowout, down to smaller leaks and spills from equipment and piping. The International Association of Oil & Gas Producers (IOGP) recently issued incident frequency data for offshore exploration drilling activities, using data sources representing the last 20 to 30 years of oil and gas operations. Two types of incidents were considered:

- "Well releases", where hydrocarbons flowed from the well at some point where flow was not intended, and the flow was stopped by use of the barrier system that was available on the well at the time of the incident
- "Blowouts", where formation fluid flowed out of the well or between formation layers after all the predefined technical well barriers failed.

Incident frequencies for drilling activities are listed in Table 29 These indicate that accidental well releases or blowouts are very rare, occurring two or three times for every 1,000 to 10,000 wells drilled. In the history of the Australian oil and gas industry, around 1,500 offshore wells have been drilled, with seven incidents of well blowouts, including the Montara incident in 2009.

Table 29-Historical frequencies of well blowouts during exploration drilling worldwide (Source: IOGP, 2010)

Incident	**Frequency**			**Unit**
	Average	Gas	Oil	
Blowout	3.1×10^{-4}	3.6×10^{-4}	2.5×10^{-4}	Per drilled well
Well release	2.5×10^{-3}	2.9×10^{-3}	2.0×10^{-3}	Per drilled well

* This data represents activities carried out to "North Sea standard", where operations are performed with BOPs installed, including shear ram, and following the two-barrier principle

9.5.2 Properties of Hydrocarbons

Hydrocarbons usually comprise hundreds of mainly carbon-based chemical structures. The relative balance of the constituent substances influences both their chemical and physical properties, which in turn affect their potential or environmental impact on marine biota. In general, hydrocarbons comprise four main groups:

- Alkanes: paraffin (acyclic) saturated hydrocarbons with director branched chains of carbon atoms;
- Naphthalene (cycloparaffins): saturated cyclic and polycyclic compounds in which hydrogen atoms maybe replaced by alkyl groups;
- Arenes: aromatic unsaturated cyclic compounds from the benzene order where the hydrogen atoms may be also replaced by alkyl groups; and
- Alkenes (olefins): unsaturated acyclic hydrocarbons with direct or branched chains and double carbon connection (the compounds of this group are not part of crude oil but are the main products of its cracking).

9.5.2.1 Crude Oil

Based on the Chuditch-1 discovery, it is anticipated that the Chuditch-2 appraisal well will only encounter dry gas. Most crude oil and condensate from the Bayu-Undan and Kitan fields are light oil with an API of 57° and a specific gravity of 0.75 (Table 30). The distillation cuts indicate that about 80% of the oil is volatile or semi-volatile (those boiling off at less than 265°C) meaning that it will evaporate readily. It is classified as a Group 1 oil (ITOPF, 2002) and if spill into the sea, would be expected to spread rapidly on the sea surface, due to its low density, and degrade through evaporation and dispersion into the water column.

Table 30-Properties of Crude Oil (from ADIOS2 database)

Parameter			**Value**
API (°)			56
Specific Gravity (g/cc)			0.75
Kinematic Viscosity @15°C (cSt)			1.24
Pour Point (°C)			< -400
Distillation Cuts			
Temperature (°C)	Vol (%)	Temperature (°C)	Vol (%)
22	3	180	3
70	12	220	6
100	24	260	11
120	33		31
135	42	330	63
160	53	400	89

9.5.2.2 Diesel

Diesel is a light petroleum distillate with an API of 30°- 32° and a specific gravity in the range 0.84 to 0.88 (Table 31). As such they are classed as Group II oils (ITOPF, 2002) such as light persistent oils. Diesels are expected to undergo a rapid spreading with moderate evaporation loss in tropical waters and, consequently, slicks are likely to break up. Diesel oils tend not to form emulsions at the temperatures likely to be found in the Timor Sea and so these will not inhibit spreading of the slick or evaporation rates.

Weathering and dispensability studies on Australian marine diesel indicate that in the case of a spill approximately 50% of the mass will be evaporated (Kagi et al., 1988). The prediction weathering behaviour from the ADIOS2 model for a constant wind speed of 4ms-1 Evaporation rates are initially high with just under 50% evaporating within the first 24 hours. Vertical dispersion rates are also high with the majority of diesel being removed from the sea surface within three days.

Table 31-Properties of Diesel Fuel Oil (from ADIOS2 database)

Parameter	Value
API (°)	30 - 32
Specific Gravity (g/cc)	0.84 to 0.88
Kinematic Viscosity @15°C (cSt)	4
Pour Point (°C)	-14
Distillation cuts	
Temperature (°C)	Vol (%)
160	3
180	6
200	11
250	31
300	63
350	89

9.5.2.3 Toxicity of Crude and Diesel

Toxicity of crude and refined products is primarily due to the volatile and water-soluble aromatic hydrocarbons (benzenes, naphthalene, and phenanthrenes) and the higher

molecular weight polycyclic aromatic hydrocarbons. The most toxic components in oil, although having the highest solubility in water, tend to be those that are lost rapidly through evaporation when oil is spilt. As a result, lethal concentrations of toxic components leading to large scale mortalities of marine life are relatively rare, localized and short-lived and only likely to be associated with spills of light refined products or fresh crude. At particular risk are animals and plants living in areas of poor water exchange.

Toxicity testing of diesel by various organizations has identified it as being toxic to a variety of marine species. The range of reported toxic concentrations is 3–80mg/L (CONCAWE, 1996).

Oil spills in marine environments have immediate adverse effects on water quality. The toxicity of oil is highest in the initial days following a spill, after which weathering processes reduce its toxic properties, leading to emulsification. Once emulsified, the effectiveness of chemical dispersants is significantly diminished.

The release of liquid hydrocarbons has the potential to cause direct, indirect, and cumulative environmental impacts, including physical oiling and toxicity effects on wildlife, localized mortality of Phytoplanktons and Zooplanktons such as krill, eggs, and larvae, habitat degradation, disruptions to fishing and tourism, transboundary political concerns, and the accumulation of oil in the food chain and sediments. Oil contamination in sediments, whether from accidental spills or drill cuttings, can lead to physical smothering or long-term pollution of benthic habitats. Additionally, contamination or the loss of food sources may have temporary effects on the marine food chain.

9.5.3 Oil Spill Modelling

The Oil Spill Modeling Study for Chuditch-2 Appraisal drilling Well in the Timor Sea was conducted using MuTeknologi Software (PT. MuTeknologi Komputasi Hidraulika). The modelling used for the simulation is stochastic modelling which aims to predict the spill's movement, spreading, weathering, and coastal impact where the spill is condensate, diesel, base oil, NADF, and SBM/NADF in the marine environment. The spill modeling was simulated for the February (West Season/Monsoon) and June (East Season/Dry Season) 2025.

Importance of Oil Spill Modeling in Offshore Drilling:

Oil spill modeling is an essential component of offshore environmental management. It predicts the movement, dispersion, and impact of potential hydrocarbon releases under different scenarios. This information informs spill contingency planning, response strategies, and mitigation measures, ensuring the protection of marine ecosystems, fisheries, and coastal communities.

Key Spill Scenarios Analyzed:

The modeling study simulated multiple spill scenarios based on different failure types, including:

- Transfer Hose Failures: Small-scale spills of diesel, base oil, and synthetic-based mud (SBM).
- Tank Rupture: A larger spill of diesel (723 barrels) due to structural failure.
- Mud Tank Discharge: Release of 400 barrels of SBM/NADF.
- Well Control Events (Blowouts): Major hydrocarbon releases from uncontrolled well flow, modeled at three increasing rates (25, 50, and 75 million standard cubic feet per day).

Each scenario was simulated for both the West Season (February) and East Season (June), accounting for prevailing oceanographic and meteorological conditions in the two dominant seasons.

Simulation Results and Environmental Impact:

Spill Dispersion:

- Diesel and base oil spills were predicted to disperse offshore, with a significant portion evaporating (~43% for diesel and ~20% for base oil).
- Synthetic-based mud (SBM/NADF) settled on the seabed, affecting benthic habitats but undergoing biodegradation (~23% within five days).
- Condensate from well blowouts showed 82% evaporation within five days, with the remainder dispersing in the water column.

Geographic Impact:

- In the West Season, spills tended to drift toward Australia's Exclusive Economic Zone (EEZ), with potential effects on the Oceanic Shoals Marine Special Purpose Zone.

- In the East Season, spills moved northwest, impacting Timor-Leste's EEZ rather than Australian waters.

Timeframe for Spill Effects:

- Most hydrocarbons reached their maximum spread within five days.
- Surface oil thickness decreased below 0.034mm, rendering it invisible to the naked eye.

Key findings from the hydrodynamics and oil spill simulation using MoTuM are summarized as follows:

a. The fates simulation results show that diesel and condensate will evaporate about 75% of the total spill after 5 days of oil spill release.
b. For base oil, the fates simulation results show that 57% will stay in the offshore for 5 days. During those 5 days, 23 % of the base oil will be biodegradable and the remaining base oil will evaporate.
c. During the West Season (February)**,** the Diesel, Base Oil, SBM/NADF, NADF, and Condensate will spread to the Oceanic Marine Special Purpose Zone, Oceanic Marine Multiple Zone and Australia's EEZ. The spill will remain offshore, and the spread will be to the East of the Chuditch-2 Well.
d. During the East Season (June), the Diesel, Base Oil, SBM/NADF, NADF, and Condensate will also spread to the Oceanic Marine Special Purpose Zone and Australia's EEZ. But the dominant spreading is to Timor-Leste's EEZ
e. For each season and scenario, the oceanic shoals Marine National Park Zone will not be affected by the spill of Diesel, Base Oil, NADF, SBM /NADF, and condensate.

For the Scenario - Well Control Event - a well control event occurs, where a spill of 1,500 barrels (bbls) of NADF occurs for 3 hours, and then a spill of 18,000bbls of condensate is released for 60 days in the West Season (February) and East Season (June). The simulation results for this scenario are presented:

- Figure 23 shows dispersion of NADF at surface in February.
- Figure 24 24 shows dispersion of NADF concentration (ppm) at near bottom in February.
- Figure 25 shows fates simulation in percentage for condensate after 5 days of release in February /West Season.

- Figure 26 shows dispersion of NADF concentration (ppm) at surface in June.
- Figure 27 shows dispersion of NADF concentration (ppm) at near bottom in June.
- Figure 28 shows fates simulation in percentage for condensate after 5 days of release in June /East Season.

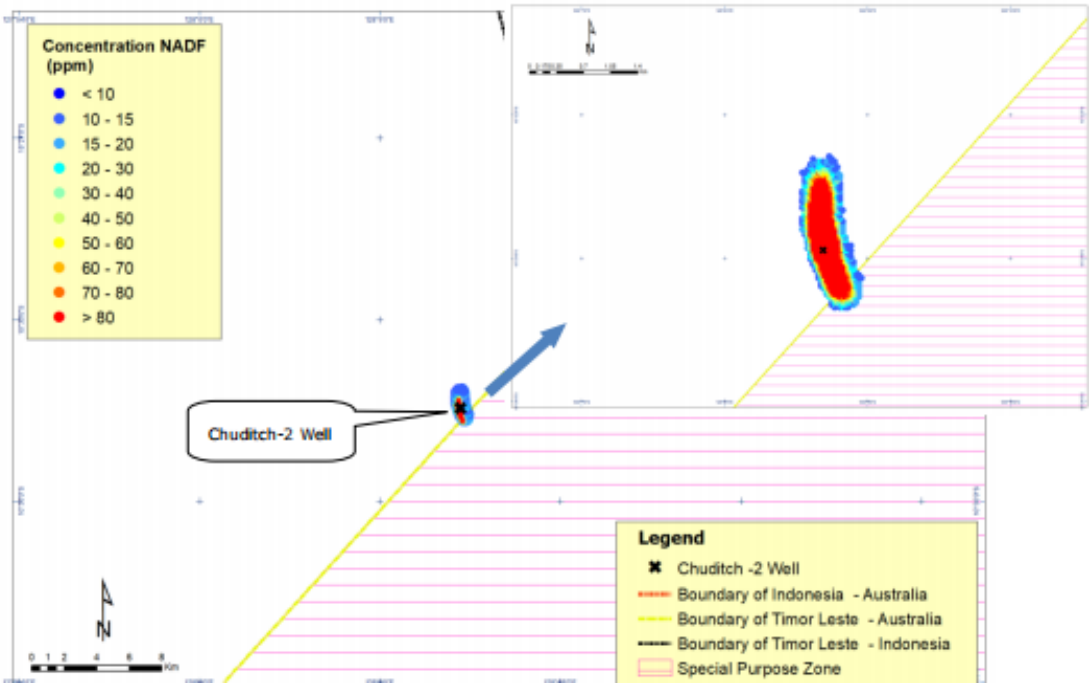


Figure 23-Dispension of NADF concentration (ppm) at surface in February

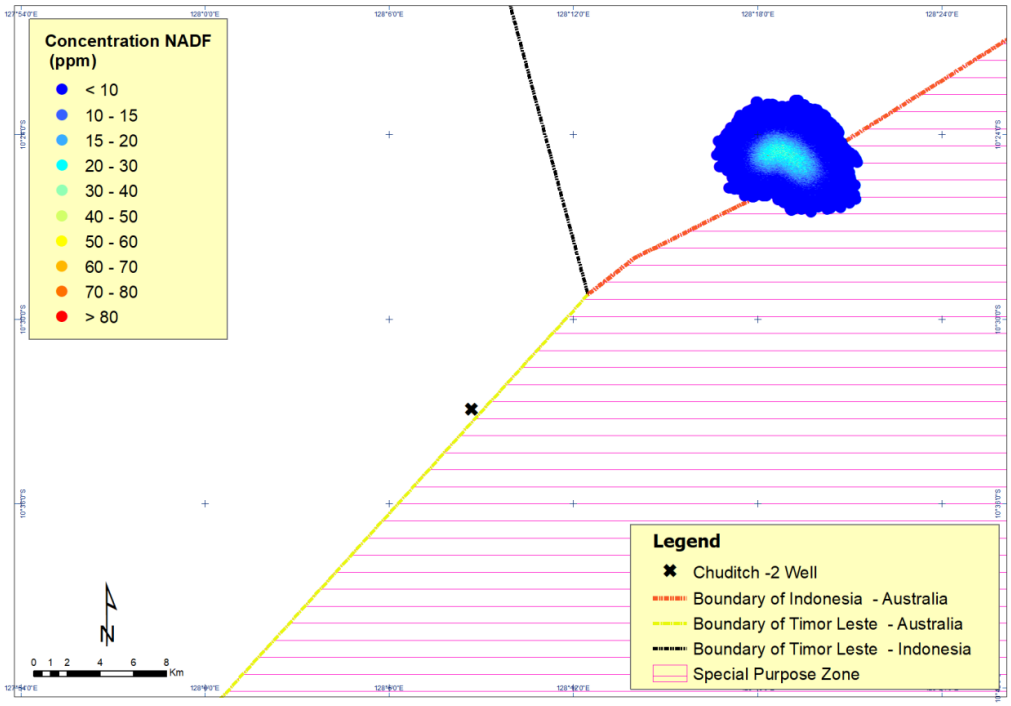


Figure 24-Dispersion of NADF concentration (ppm) at near bottom in February

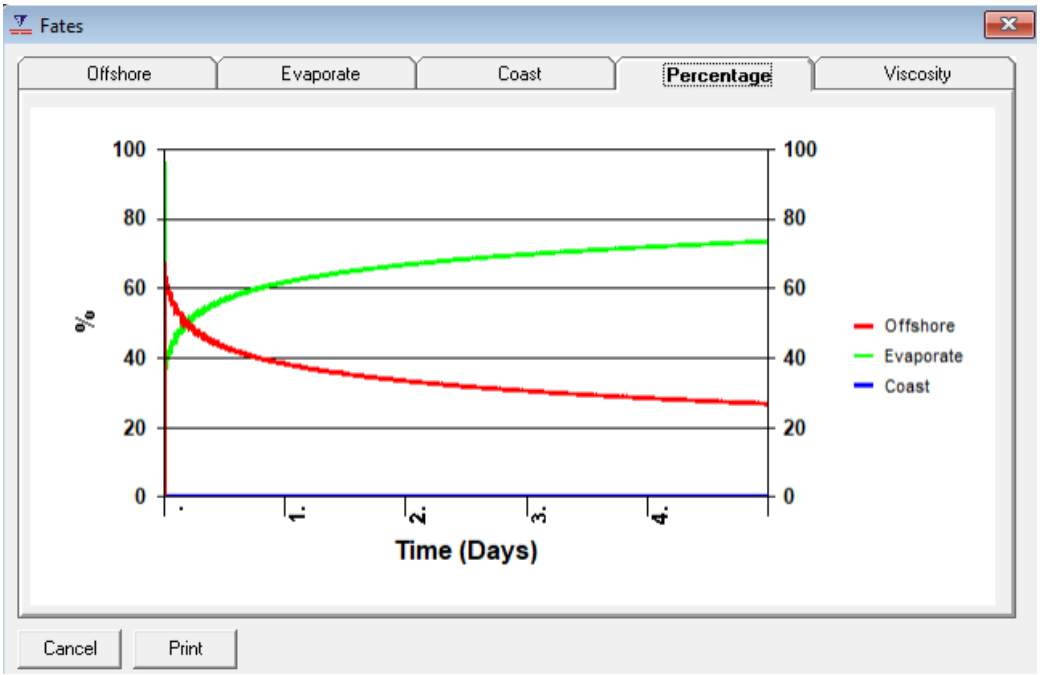


Figure 25-Fates simulation in percentage for condensate after 5 days of release in February/West Season

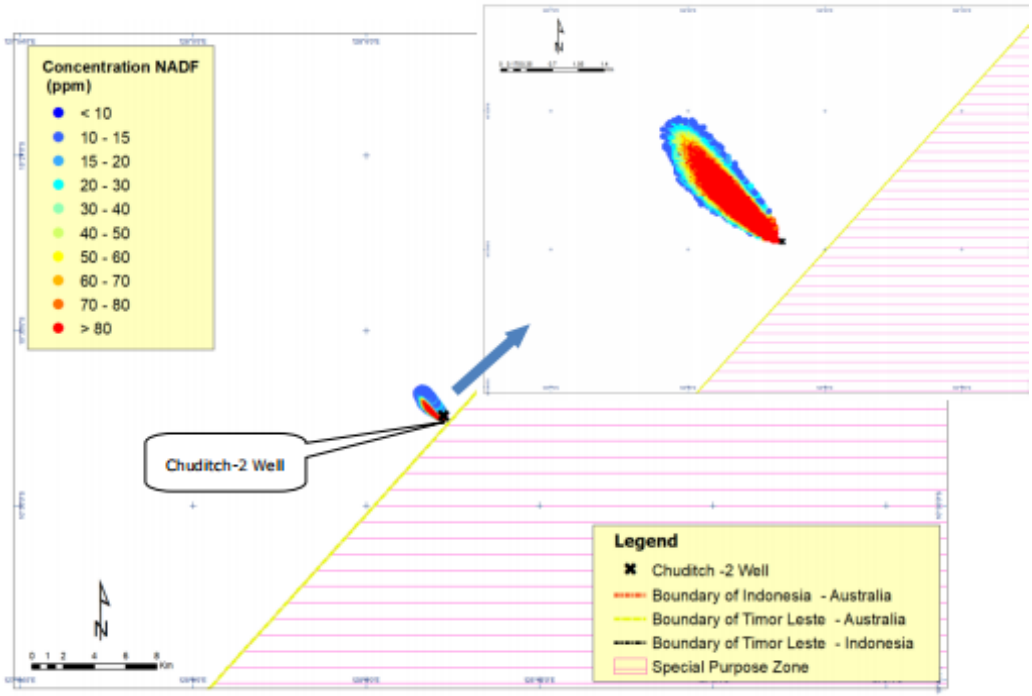


Figure 26-Dispersion of NADF concentration (ppm) at surface in June

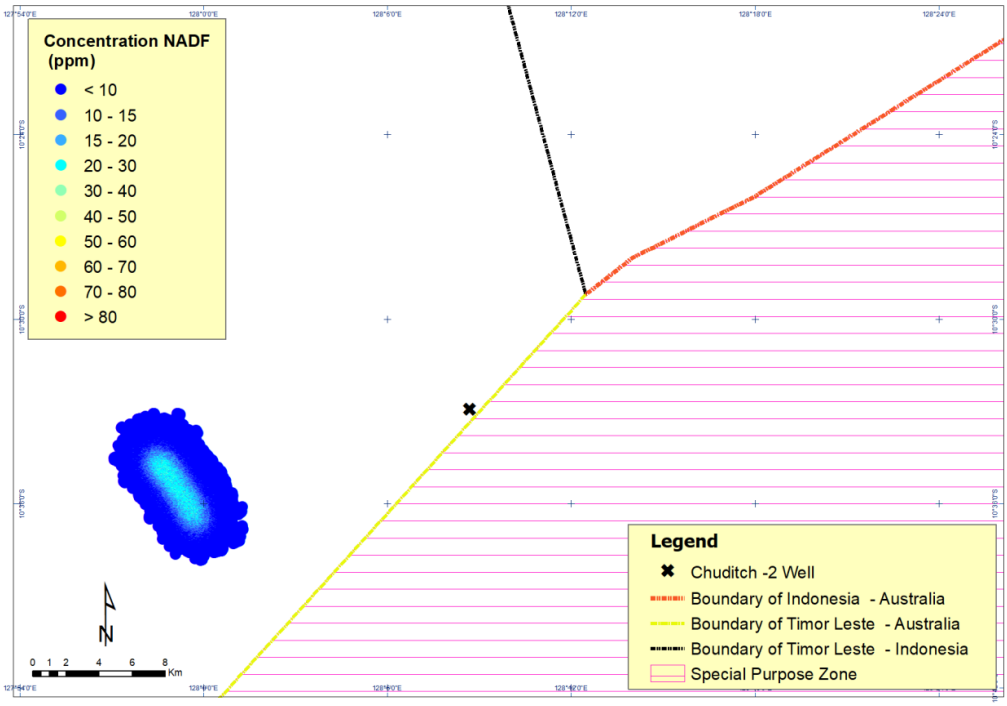


Figure 27-Dispersion of NADF concentration (ppm) at near bottom in June

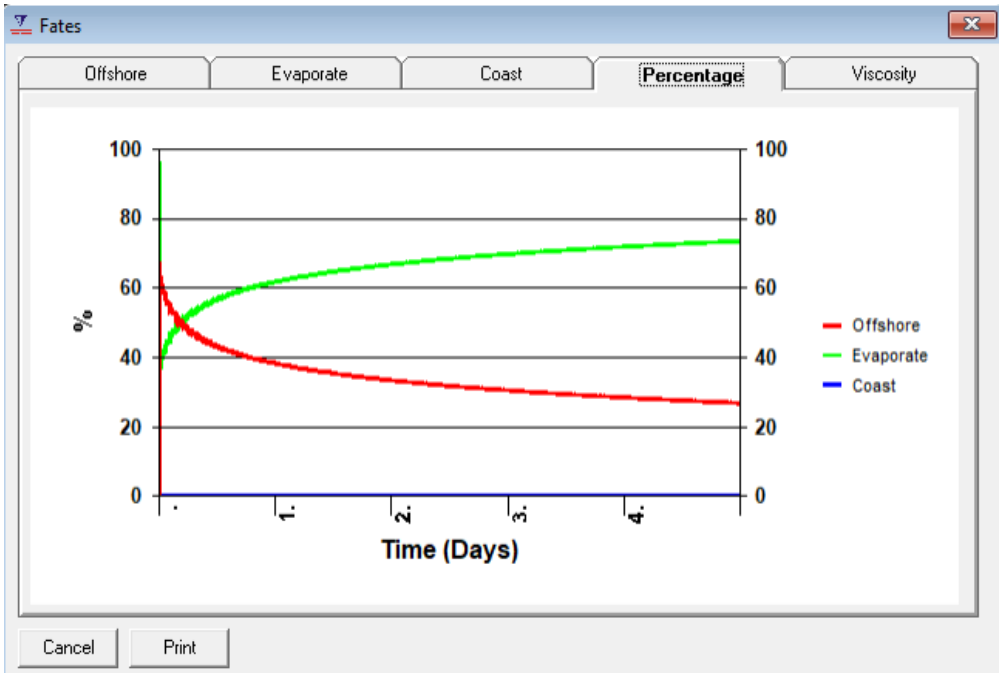


Figure 28-Fates simulation in percentage for condensate after 5 days of release in June/East Season

9.5.4 Potential Environmental Effects

Oil spill trajectory modelling has shown that any spill of either crude oil or diesel from the proposed drilling area is highly likely to dissipate before it could make contact with a shoreline. Thus, nearshore marine communities and habitats of the Timor-Leste and Indonesian coastlines (which may contain corals, seagrasses, mangroves, turtle nesting beaches, intertidal and subtidal communities) are not considered to be at significant risk from the drilling program. Given the oceanic environment, the resources considered to be most at risk are pelagic Phyto- and zooplankton, pelagic fish, cetaceans, marine turtles and surface-feeding seabirds.

Oil can affect marine biota in a variety of ways through acute toxicity, and sub-lethal chronic effects on morphology, physiology and behaviour, some of which may ultimately lead to mortality. Weathering influences the toxicity of oil and its constituents. Weathering processes include spreading, evaporation, dissolution, dispersion into the water column, formation of oil-in-water emulsions, photochemical oxidation, microbial degradation, absorption to suspended particulate matter and stranding on the shore or sedimentation to the seafloor. Relatively lighter, more volatile, mobile and water-soluble compounds will tend

to evaporate fairly quickly into the atmosphere. The lighter components of oil are usually the most toxic but are also those most readily lost through evaporation and the rate of evaporation loss increases with temperature. Consequently, weathered oil is generally less toxic than fresh oil (Swan et al., 1994) and so lethal concentrations of toxic components that could lead to death of marine organisms are relatively rare, localized and short-lived.

Swan et al., (1994) reviewed the environmental effects of oil spills across abroad spectrum of marine organisms and communities. Their review indicated that the response of phyto- and zooplankton to oil varied between species. However, phyto and zooplankton could be generally characterized as having a high tolerance and rapid recovery (no long-term effects). Thus, the risk of an oil spill occurring and persisting at toxic concentrations for a sufficient period of time to have long-term effects on phyto- and zooplankton is considered to be negligible.

Organisms inhabiting the water column such as cetaceans, marine turtles and fish may be exposed to oil in the event of an oil spill. Pelagic fish are highly mobile and capable of diving to avoid exposure to oil, so the threat of significant effects is considered low. Cetaceans and marine turtles would be more likely to come into contact with oil as they return to the surface to breathe. The effects of oil on cetaceans and marine turtles would include oiling of parts of the body, irritation of the eyes, inhalation of volatile oil components and ingestion. Inhalation and ingestion are likely to have a more significant effect on individuals that come into contact with oil than surface contact (Swan et al., 1994). Being mobile, however, these organisms would be expected to be able to move away from heavily oiled areas. It is difficult to predict with certainty the number of cetaceans or turtles that would be likely to be exposed in the event of an oil spill. However, in the open ocean environment, it is probable that only a small number of individuals would be exposed. In the event of an oil spill, SGBU's priority would be to protect breeding and feeding areas to avoid impacts on populations. As per the EBS study there is no breeding and feeding area near the Chuditch-2 drilling well.

Swan et al., (1994) identifies seabirds as being the most vulnerable organisms to an oil spill in oceanic environments. Oil spills can have a variety of effects including fouling of the plumage, ingestion of oil, effects on reproduction and physical disturbance. Many of the species that occur offshore are surface-feeding or plunge diving pelagic birds, so that oil slicks would potentially interfere with feeding and increase exposure risk. Preening to

remove oil would also expose the birds to direct ingestion of oil. Given the open oceanic location of the drilling site, remote from any landmass, the number of seabirds likely to be exposed in the event of an oil spill is expected to low.

Preliminary modelling results for various spill scenarios, including a minor fuel transfer hose leak (30 barrels) and a vessel bunker loss (723 barrels), indicate that approximately 40–50% of the spilled volume evaporates or disperses within 48 hours, with full dissipation occurring within five days (MuTek, 2024). The modelling predicts a northwest/southeast drift depending on tidal phases. In all modelled scenarios, the spill remains offshore and does not impact any areas of known environmental significance. Potential impacts on marine life and seabirds will be assessed in this EIS, where strategies for avoidance and mitigation are outlined in Table 31-Summary of safeguards.

A fuel spill may occur during refueling operations. Such spills are expected to be small, localized, and subject to rapid dispersion and volatilization. While fuel spills can temporarily impact surrounding waters, their effects are short-lived due to natural mixing and dissipation.

9.5.5 Management of Hydrocarbons

SGBU's safeguards to be implemented for the minimization of environmental impacts associated with oil spills will comprise:

- Procedures to reduce the likelihood of oil and chemical spills occurring;
- Procedures to minimise the volumes spilled; and
- Actions to be taken to minimise the environmental consequences in the event of a spill occurring, i.e., spill response.

These safeguards are described in Table 32. In addition, SGBU will develop an Oil Spill Contingency Plan (OSCP), which will be submitted for approval to ANP. It details the practices and standards to be implemented in the event of an accidental hydrocarbon discharge.

Table 32-Summary of Safeguards to Manage Hydrocarbons Spills

Scenario	Description of Safeguards
Well blow-out	• Comprehensive understanding of the nature of hydrocarbon formations including reservoir pressures and oil characteristics. • Use of industry standard drilling practices and equipment. • Installation of Blowout Preventer (BOP) to reduce the risk of

Scenario	Description of Safeguards
	uncontrolled discharges / safety values to shut in well in the event of release from drilling activities. • Pressure testing the casing string. • Adoption of regulatory standards, industry standard, operational and maintenance practices, personnel training programs and procedures to minimise oil spill risk. • Continuously monitoring for abnormal pressure parameters during drilling.
Leak from fittings and connections	• Pressure tested equipment. • Planned maintenance is undertaken and recorded. • Equip facilities with safety features, such as Emergency shutdown (ESD) valves limit the size of the release.
Vessel collision	• Exclusion zone established around the rig. DNMA notified of location of the rig. • Drilling rig not located in commercial shipping lanes.
Hydraulic fluid leaks	• Planned maintenance undertaken and recorded. • Low toxicity hydraulic fluids used. • Manned operation (visual detection of release). • Drip pans/bunds
Oil Spill Prevention and Emergency Response	• Develop and implement an Oil Spill and Emergency Response Plan. • Provide spill clean-up kits for immediate response to accidental spills.

9.6 Solid and Hazardous Waste

9.6.1 Source and Characteristics

During the offshore drilling activity, a wide variety of liquid, solid and gasses wastes are expected to produce on the rig and from the drilling activity, some of which are discharged directly or indirectly into the marine environment.

Most waste generated by the proposed appraisal drilling project are associated with on-board activities during the drilling stage. These wastes can be either hazardous wastes or non-hazardous wastes, which will need to be treated accordingly.

The volumes of wastes produced vary depending on the stage of the drilling activity. The main wastes produced are in the form of aqueous or liquid such as drilling fluids/ mud, cuttings, well treatment chemicals; process, wash and drainage water; sewerage, sanitary and domestic wastes; spills and leakages; and cooling water.

Many of these wastes can be easily recycled or reused; batteries can be segregated and recycled, radioactive smoke detector elements can be returned to the vendor for recycling, wood pallets can be recycled, reusable bins can replace drums for chemical storage, reusable screens can be used for oil and air filters on vehicles, and vehicle lube oil can be recycled.

Solid and hazardous wastes generated during drilling will include:

- General non-hazardous wastes;
- Hazardous wastes; and
- Maintenance wastes.

General non-hazardous waste includes scrap materials, packaging, wood and paper and empty containers. These non-hazardous waste materials will be stored on board the vessel in suitable containers (segregated from hazardous waste materials) ahead of transport back to shore for disposal/recycling in accordance with local regulations.

Domestic waste generation, including paper, wood, pallets, cardboard, scrap metal, and packaging materials, is expected to be insignificant due to the short duration of the appraisal drilling activities. All waste will be appropriately sorted, compacted where feasible, and stored based on type and disposal route, for later transfer to shore. Hazardous materials, including those considered 'special wastes', will be stored separately from non- hazardous materials in designated containers. The segregation, compaction, storage, and transfer of waste materials will be short-term and transient in nature, with a low likelihood of waste escaping during transport to shore. All domestic waste will be transferred to shore for proper disposal in accordance with relevant standards and procedures. Improper management of non-hazardous solid wastes could result in unpleasant visual, and odour impacts and may pose safety risks to workers' health and safety.

Food waste, being biodegradable, will be ground and discharged directly into the marine environment. While localized organic enrichment may occur, no significant impacts are anticipated from this discharge.

Hazardous wastes are defined as being waste materials that are harmful to health or the environment. Hazardous wastes generated include recovered solvents, excess or spent chemicals, oil contaminated materials (e.g., absorbents, filters, and rags) and batteries. All

hazardous waste materials generated will be documented and tracked, segregated from other waste streams and stored in suitable containers. Recyclable hazardous wastes, such batteries, will be stored separately from non-recyclable materials. All hazardous waste materials will be transported to shore for disposal or recycled at an approved and licensed facility.

Maintenance wastes include used chemicals, lubricating oils, paint, solvents, rags and other cleaning items. Maintenance wastes will not be discharged to the marine environment but will be stored in an appropriate container until the materials are transported onshore for recycling or disposal at approved and licensed facilities.

The volume estimate of wastes generated vary depending on the stage of the drilling activity. The Table 33 gives waste type and volumes used during the appraisal Chuditch-2 drilling project.

Table 33-Summary of type of waste produces anticipated during the appraisal drilling project

Waste type/Volumes used	**Volume/weight**
Putrescible waste	1kg/pax/day
Waste water discharge	40 ltr/pax
Haz Chems	500 kg
Non Haz Chems	500 kg
Oily rags/waste	300 kg
Scrap metal	1000 kg
Metal drums	500 kg
Plastic receptacles/Drums	200 kg
Recyclables Wood/plastic/paper	8000 kg
Batteries/Accumulators/Electrical waste	200 kg
Lubricants	350 ltr

9.6.2 Potential Environmental Effects

The effects of discharges of solid or hazardous wastes to the marine environment would vary depending on the nature of the material involved. For example, solid wastes such as plastics are persistent in the environment and have been implicated in the deaths of a

number of marine species including marine mammals and turtles. This is due to ingestion, inhalation, or physical entanglement.

Solid and hazardous wastes would be transferred to Timor-Leste or the Australian mainland for onshore recycling or disposal at appropriate locations. Any release of solid and hazardous wastes into the marine environment would be recorded as an environmental incident and treated accordingly by SGBU's incident investigation and corrective and preventative action processes.

With the effective implementation of SGBU's policy to transfer solid and hazardous wastes onshore for recycling or disposal, these wastes are not expected to have any impact on the marine environment.

9.6.3 Management of Solid and Hazardous Wastes

Safeguards to protect the environment from the potential impacts of solid and hazardous wastes entail:

- A Waste Management Plan will be prepared by the relevant contractor.
- All personnel will be trained in the correct waste management procedures through the induction process.
- Reducing waste at the source, and recycling and reusing waste onboard wherever feasible.
- Prohibiting the disposal of waste overboard, except for: – comminuted putrescible sewage and food waste.
- Biodegradable food waste must be ground prior to discharge into the marine environment.
- Ensuring that all waste treatment and disposal requirements specified during the planning process are met.
- Collecting and compacting waste for onshore disposal.
- Providing a designated and adequately equipped waste storage area onboard.
- Implementing and regularly updating the waste management plan and waste record (which includes waste volume, type, and disposal route) by the rig operator and supply vessels.
- Considering waste segregation at the source.
- Ensuring that waste containers are properly covered to prevent loss overboard.

- Containers containing spent oils, lubricants, and chemicals should be returned to shore for proper storage and handling.
- Minimizing packaging waste by considering bulk supply options.
- Equipment and procedures will be in place to respond to any releases of hazardous wastes.
- Records will be maintained of solid and hazardous waste volumes generated and transferred onshore for recycling or disposal.

9.6.4 Onshore Waste Management

Wastes from the appraisal drilling, which include boards, pallets, paper, plastics, etc. will be shipped to shore for disposal. SGBU, wherever possible, will minimize their wastes generation and apply the recycle and reuse concepts on board. This provides economic incentives to the operator as fuel-related costs in shipping are saved. Apart from that, with limited spaces on the platform, it further encourages the operator to limit wastes derived from consumables. Onshore waste shall be in Darwin / Timor-Leste and local companies will be contacted for handling and disposal as per regulations.

Overall, the potential impacts associated with the storage and handling of waste materials on the rig and vessels are considered to be low and can be effectively mitigated through the implementation of robust waste management procedures and best management practices.

9.7 Drilling Discharges

9.7.1 Source and Characteristics

The major discharges associated with offshore drilling are drill cuttings and drilling muds. Drilling muds are used to cool and lubricate the drill bit, to remove drill cuttings from the well, maintain a hydrostatic column to maintain safety during drilling by assisting in maintaining well pressure control (Petroleum Engineer's Guide to Oil Field Chemicals and Fluids, 2012).

This project will use Water Based Mud (WBM) for the top-hole section and Synthetic Based Mud (SBM) when drilling through technically challenging formations.

9.7.1.1 Drill Cuttings

Drill cuttings are crushed rock generated by the drill bit as it penetrates into the seafloor. The composition of the cuttings is determined by the nature of the formation being drilled.

The cuttings retrieved are expected to range in size from very fine to very coarse particles, with a mean size no larger than one centimeter.

9.7.1.2 Drilling Fluids

SGBU will be using two classes of drilling fluid systems:

- Water based muds (WBMs), where the continuous fluid phase is water.
- Synthetic based muds (SBMs), where the continuous fluid phase is a well characterised synthetic organic compound (NADF).

The choice of drilling fluid was made at an early stage in consultation with ANP.

There are three main pathways for drilling muds to enter the marine environment during drilling activities:

- Discharge of whole water-based drilling muds to the ocean at the end of the applicable section of the well is drilled;
- Residual mud coating on drill cuttings that are discharged to the ocean; and
- Unintentional spills.

The details of water-based muds and synthetic based muds are described in chapter 4 section 4.3.5.7.

Water Based Mud (WBM)

WBMs use fresh or seawater as the continuous phase and the most common systems include bentonite, KCl, polymers and PHPA. They may also contain a range of additives such as biocides, weighting agents, alkaline chemicals, various salts, defoamers, corrosion inhibitors, scale inhibitors, drilling lubricants, lost circulation materials and pipe release agents. A typical formulation of a water-based fluid system is shown in **Error! Reference source not found.**.

Table 34-Typical Water Based Drilling Fluid System Formulation

Component	Function	Concentration
Drill water		As required
KOH (Potassium hydroxide)	pH Control	0.5 lb/bbl
NaCO3 (Sodium carbonate)	pH Control	0.5 lb/bbl
KCl (8%)	Clay stabilization and weighting agent	41 lb/bbl

PHPA (solid)	Cutting's encapsulation and stabilization	1 lb/bbl
Polyanionic cellulose	Viscosifier and fluid loss control	0.5–1 lb/bbl
Bentonite (Clay)	Viscosity control	3 lb/bbl
Xanthum gum polymer	Viscosifier	1 lb/bbl
Polyglycol	Shale stabiliser	3% /bbl
Barite	Weighting agent	As required

WBMs deliver acceptable performance for drilling non-challenging wells (e.g. vertical wells with generally unreactive lithologies). They provide the least environmental impact due to their non-toxic nature and ability to disperse and biodegrade rapidly. However, the potential for reactive lithologies in the Cretaceous section in the Chuditch area, as encountered by a number of offset wells, suggests that SBM drilling fluids will be necessary.

WBMs are routinely discharged to the ocean at the end of drilling, or when the mud property requirements change. SBMs will be stored and returned to shore base for treatment and disposal or resale at the end of the project.

Synthetic Based Mud (SBM)

The NADF to be used in the construction of the 12¼" section of the Chuditch-2 well will be Saraline 185V, an OCNS "E" rated substance. Saraline 185V was the subject of an application for use by SGBU granted by ANP on 19th July 2024. ANP reference ANP/HSE/S/24/106.

Approved for Offshore Discharge and High Biodegradability

Saraline 185 V is an 'E' rated (Lowest Environmental Hazard) product under the OCNS (Offshore Chemical Notification Scheme) and approved for offshore discharge in more than 40 countries including Timor-Leste, Malaysia, Australia, New Zealand, Thailand, Indonesia, Brunei, India, Nigeria, Dubai and China due to its extremely favourable environmental profile.

Saraline demonstrated excellent bioremediation properties even considering onshore land farming methods as proven in studies in Bangladesh, China and New Zealand. (IOGP,

environmental fates and effects of ocean discharge of drilling cuttings and associated drilling fluids from offshore oil and gas operations, report No 543, March 2016.)

Saraline 185V is readily biodegradable in both marine water (OECD 306 test) and fresh water (OECD 301F test).

Low Toxicity

Its linear structures result in low toxicity to fish, invertebrates and algae in the water column and sedimentary toxicity testing. Notably, Saraline 1985 V does not bioaccumulate in marine organisms.

9.7.2 Mud and Cutting Modelling

SGBU hired PT. MuTeknologi Komputasi Hidraulika to perform drill cuttings and mud dispersion modelling at the Chuditch-2 Well using MuTeknologi Software to assess the potential impacts of the discharge on the environment.

The drill cuttings and mud dispersion model for the Chuditch-2 Well in the Timor Sea is a crucial component of the EMP. In addition to assess the environmental impacts of drilling waste discharge, this study also ensures compliance with regulatory standards and best environmental practices. The findings inform mitigation strategies to protect marine ecosystems while enabling safe and sustainable offshore drilling operations.

Scenario Simulations and Findings:

The study conducted hydrodynamic and dispersion modelling under two seasonal conditions—West Season (February) and East Season (June) - to predict the spread and deposition of drill cuttings.

Two drilling stages were evaluated and analysed:

The modelling simulation Near Seabed Discharge and four scenarios were evaluated and at Mid-Water Discharge at 5m, 15m and 25m depths were evaluated.

Key Results

Sediment Dispersion: Near-seabed discharge resulted in localized cuttings deposition (<200m radius, 100% coverage), while mid-water discharge dispersed sediment over larger areas (~250m radius, 7% coverage).

Total Suspended Solids (TSS) Concentration: Maximum TSS levels varied by scenario but remained below regulatory limits (25ppm) beyond 100m from the discharge point.

Seasonal Differences:

February (West Season): Dispersal patterns favoured a Northerly and Southeasterly transport.

June (East Season): Drilling cuttings were transported northwest and southward.

Deposition Thickness: Near-seabed discharge resulted in 200mm thickness at the dumping site, whereas mid-water discharge led to <0.5mm thickness over wider areas.

In conclusion and environmental relevance, this study demonstrates that controlled discharge and strategic well placement significantly reduce sediment accumulation and water quality impacts.

Key takeaways include:

Localized Impact: Most drilling waste settles within a 200m radius without exceeding regulatory thresholds.

Effective Waste Management: The use of high-efficiency shale shakers and cuttings reinjection can further minimize discharge.

Regulatory Compliance: Findings support adherence to MARPOL 73/78, Timor-Leste's environmental laws, and best offshore drilling practices.

The modelling results guide spill prevention, waste handling, and environmental monitoring measures, ensuring that the Chuditch-2 drilling operations align with sustainable offshore resource extraction and ecosystem protection.

This study is summarized in the following figures:

The mud and cuttings modelling showed that drilling activities could increase the sediment deposition and total suspended solids (TSS) concentrations near the seabed and at very low levels up to 2km from the Chuditch-2 well, depending on dumping scenarios and season (MuTek 2024). As shown in Figure 29 and Figure 30 the dispersion modelling indicates a north and east dispersion trajectory for drilling activities in February, compared to a northwest-southeast dispersion trajectory in June.

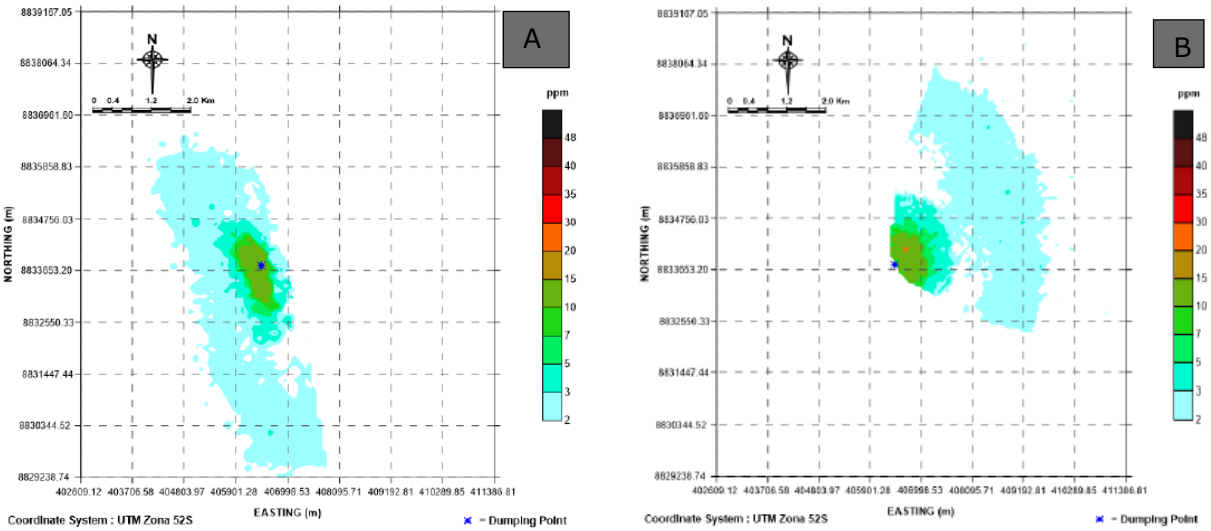


Figure 29 a and b-Results of mud dispersion modelling showing plume extent for maximum total suspended solids discharged at 5 m below mean sea level in (A) February and (B) June. Adapted from MuTek, 2024

However, in both seasons the adverse effects of sediment deposition and TSS plumes would be limited to the immediate vicinity of the well site and discharge location, with a maximum sediment deposition thickness of 0.7 – 1.2 mm and coverage of less than 10% (MuTek, 2024). Also of note is the potential movement into Australian waters of the modelled plume for drilling activities in June (Figure 31).

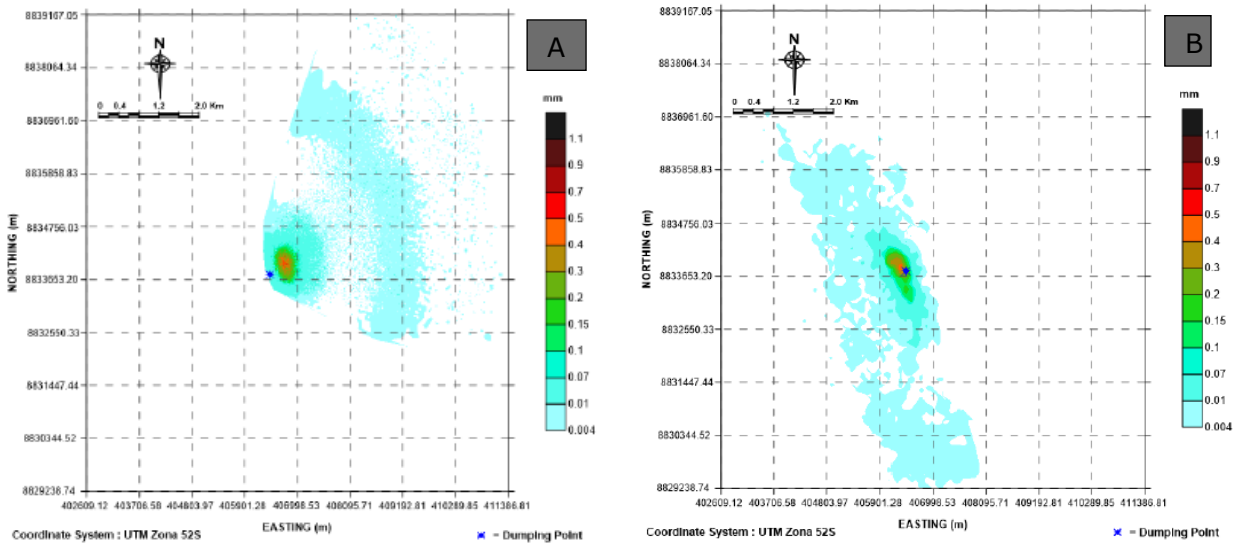


Figure 30 a and b-Drilling cuttings modelling showing cutting deposition (mm) limits for a discharge at 5 m below mean sea level in (A) February and (B) June. Adapted from MuTek, 2024

The Chuditch-2 location is approximately 700m from the Australia EEZ. As indicated in Figure 8, Modelling indicates there is no realistic probability of cuttings deposition crossing into Australian waters (Figure 32). Under certain conditions, a plume of turbid water may progress into Australian territorial waters but at a level of between 5-25ppm, which is analogous to TSS/turbidity levels produced naturally in the region influenced by passing weather systems (Woodside, 2004, Pineda et al., 2016, Pineda et al., 2017).

The dispersion modelling indicates a northwest-southeast dispersion trajectory for drilling in June. However, the adverse effects of sediment deposition and TSS/turbid plumes will be limited to the immediate vicinity of the well site and discharge location, with a maximum sediment deposition thickness of 0.7-1.2mm and coverage of less than 10% (MuTek, 2024). Also of note is the potential movement of the modelled plume of TSS/turbid water from drilling activities in June into Australian waters (Figure 31).

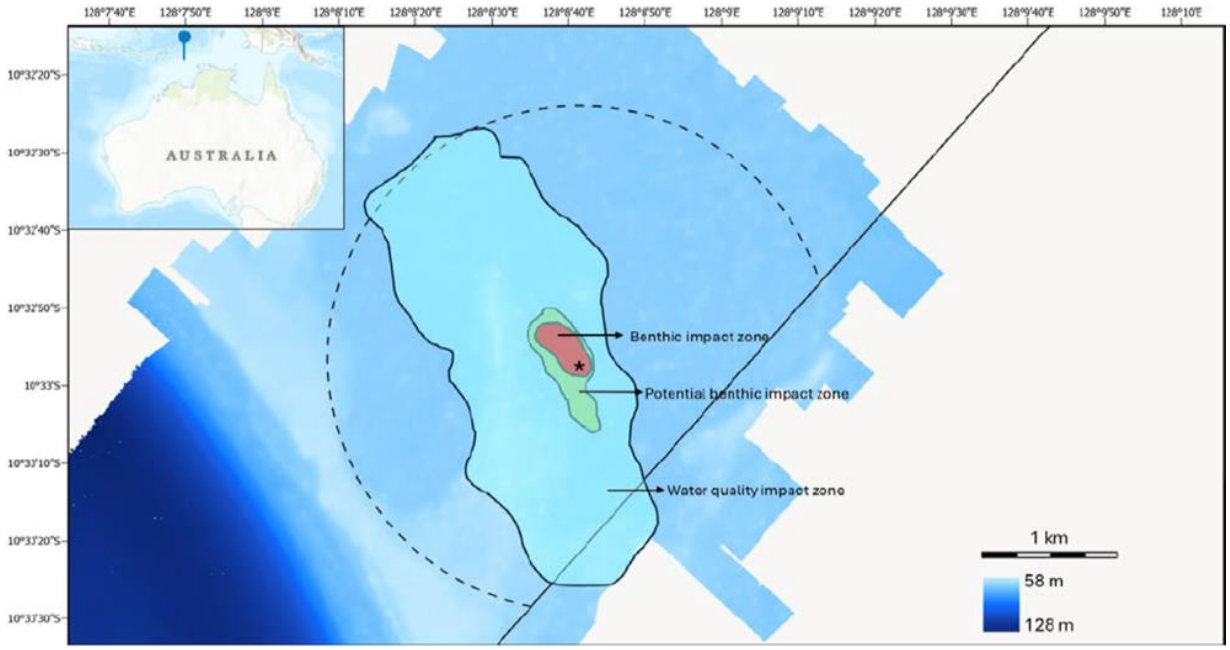


Figure 31-Stylised impact zones based on modelled cutting deposition for June. The dotted line indicates area of operations centred around the Chuditch-2 well (asterisk) and the solid oblique line indicates the boundary to the Australian EEZ. Adopted: MuTek, 2024

Modelling predicts that cuttings will settle to the seabed within 1 km or less of well centre at decreasing concentrations to 0.3mm/m^2. Cuttings deposition outside that radius will be highly dispersed and concentration below the expected threshold for environmental impact. Figure 32 below shows the spatial extent of cuttings deposition when discharged 5 metres

BMSL noting the average density of the deposition at the seabed drops below 0.5mm/m^2 approximately 200 metres from well centre.

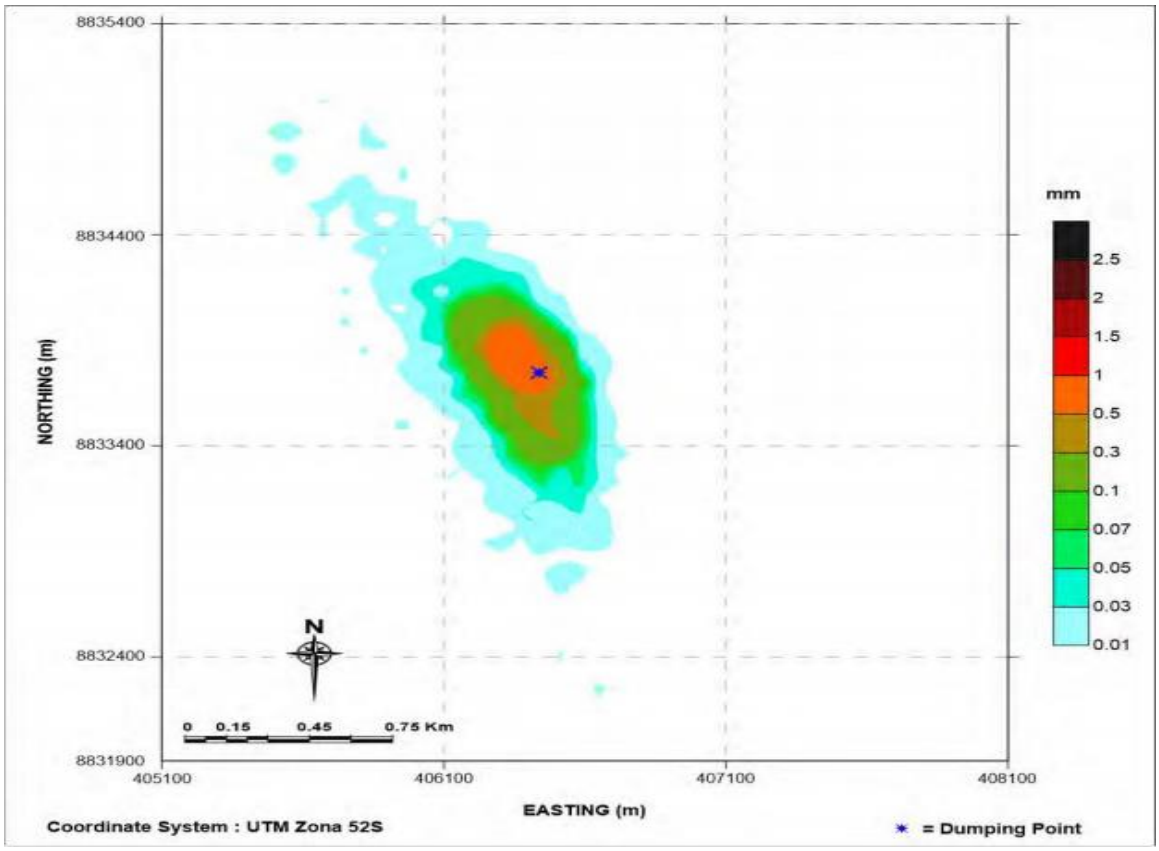


Figure 32-Spatial extent of Cutting Deposition (mm)-discharge at 5m bmsl in June. Adopted: MuTek, 2024

9.7.3 Potential Environmental Effects

The potential environmental effects associated with the discharge of drill cuttings and muds relate primarily to:

- The toxicity of the drilling fluids;
- Increases in water column TSS/turbidity;
- Smothering and alteration of sediment characteristics;
- Seabed oxygen depletion if smothered by cuttings; and
- Leaching of materials from cuttings.

Immediate potential impacts from cuttings discharge are the smothering of infauna and localised benthic community and the effects of the discharged drill cuttings contaminated with SBM, we note the properties of the ANP approved NADF, Saraline 185V. Cuttings

modelling (MuTek, 2024) refer to Figure 32 Spatial extent of Cutting Deposition (mm)–discharge at 5m bmsl in June. Modelling predicts that cuttings will settle to the seabed within 1km or less of well centre at decreasing concentrations to 0.3mm/m^2. Cuttings deposition outside that radius will be highly dispersed and concentration below the expected threshold for environmental impact. The environmental effects of discharged drill cuttings appear to be confined to the potential smothering effect of cuttings on the seabed fauna in the immediate area of discharge. Storms may further disperse the cuttings so that they become undetectable.

Affects from Total Suspended Solids (TSS) in the water column

Modelling for total suspended solids in the water column in the month of June 2025 was conducted. Modelling predicted TSS levels of 200ppm immediately surrounding the cuttings discharge point 5m bmsl, however TSS levels decreased to 25ppm or less at +/- 50m from the discharge point (MuTek, 2024), a level which is analogous to turbidity levels produced naturally in the region seasonally due to passing weather systems. (Woodside, 2004, Pineda et al., 2016, Pineda et al., 2017). Any potential impact on marine life and birds will be considered in the EMP where strategies to avoid/mitigate the effects on the environment will be considered.

Smothering and Alteration of Sediment Characteristics

There is a high likelihood that there will be some localized smothering of the benthic invertebrate communities, particularly during the drilling of the top-hole section when cuttings are discharged directly to the seabed in the immediate vicinity of the drill hole. Smothering of benthos is likely to occur close to the discharge point for drilling of the wells, mainly along the axis of the predominant current. Some habitat disturbance is likely to occur due to the difference in particle characteristics, such as size and abrasiveness, to the existing sediment. However, the severity of this impact will be slight, due to the low toxicity of the seawater, WBS and SB, the short time period, the small area potentially affected and the action of water currents in dispersing this material.

To predict the fate of drill cuttings within the PSC-TL-S0-19-16 permit area, a drill cuttings model would be based on the Chuditch-1 well location, which is predicted to show that cuttings would settle within hundred metres of the well and at low concentrations and that impacts on benthic organisms from smothering by drilling cuttings would be localized. Thus, SGBU expects the effects of drilling cuttings from the Chuditch-2 well to also be localized.

Leaching of Materials from Cuttings

The heavy metal content of cuttings from Chuditch-2 well is considerably based on the characteristics of the host rock and it is therefore difficult to make generalized predictions of metal leaching and its effects (Swan et al., 1994). The analysis of drill cuttings in other fields (ESSO 1993) has shown that the concentration of metals contained within cuttings is generally within the range of concentrations of typical marine sediments and it is not anticipated that any significant leachable compounds will be found for the proposed drilling program.

Metals in residual drilling mud on cuttings would be transported to the seabed (or removed with the drilling muds to a disposal location). However, the potential leachate in these muds (i.e., metals) are biologically unavailable or are not insoluble form (with the exception of very minor quantities of formation fluids which may be circulated) and therefore do not constitute a pollution threat (Neff et al., 2000). Barite and bentonite may contain some heavy metal concentrations but not in a readily bioavailable form. Hydrocarbons may also be present in the cuttings but the volumes of hydrocarbons that maybe transported to the seabed via drill cuttings is relatively minor and unlikely to cause any significant environmental effects (Swan et al., 1994).

9.7.4 Management of Drilling Discharges

SGBU's safeguards to protect the environment from the potential impacts of the drilling discharges will comprise:

- An Environmental Management Plan (EMP) for the drilling of the appraisal well. SGBU will develop an EMP and seek approval of the EMP prior to conducting drilling.
- The EMP will include a detailed risk assessment and development of risk registers specific to the drilling campaign.
- Use of WBMs, comprising seawater and pre-hydrated gel sweeps for the riserless section of the hole and an SBM for the riser section of the hole.
- Implement onboard separation of drilling muds using a series of shale shakers and centrifuge before disposal to maximize recovery and reuse.
- Ensure recovered drilling fluids are recycled, while drill cuttings and associated fluids are treated to meet statutory discharge requirements. Onboard recovery of muds to minimise discharge of residues on cuttings.

- Discharge cuttings from the 12 ¼" sections through a cuttings caisson several meters below the sea surface to enhance dispersion. Transfer and handling procedures would be in place to ensure that the potential for concentrated mud components being spilled on the rigor during transfer to enter the sea is low.
- Transfer and drainage systems on board the rig. In the event of a spill of drilling materials on board the rig, liquid material would be diverted to the drainage sump or slops tank. Dry material would be contained on deck until it can be cleaned up.
- Water column turbidity caused by the drilling cuttings/fluids plume will be minimised by maintaining the cuttings shakers equipment aboard the rig at optimum efficiency and correct selection of shaker screens.
- Routine checks will be made of the cutting's shakers and other solids control equipment, to ensure that cuttings are not contaminated with oil prior to discharge.
- MODU procedures will ensure that any overboard discharges meet the legislative standards for oil-in-water (OIW). Conduct thorough analysis of drill cuttings and fluid discharges to prevent oil contamination.

9.8 Liquid Waste Streams

9.8.1 Source of Liquid Waste

On the jack-up rig liquid waste streams are the deck drainage, laboratory waste, cooling and reject water, Sewage, Grey Water and Putrescible Wastes, and discharge from Ballast water.

9.8.2 Potential Environmental Effects

9.8.2.1 Deck Drainage

The volume of deck drainage water that is likely to be discharged at any given time is expected to be low. Furthermore, the concentrations of oil, grease and trace metals and other contaminants that could potentially enter the marine environment as a result of deck wash activities are expected to be below. There is unlikely to be a detectable environmental effect due to the expected low volumes of deck drainage in relation to the high dilution rates afforded by the open ocean environment of the permit area.

9.8.2.2 Laboratory Wastes

The procedures and design of the facility will be such that the risk of discharge of laboratory wastes is very low. The concentrations of chemicals likely to enter the marine environment, as a result of laboratory activities, are unlikely to cause any detectable environmental effect because of the very small quantities involved. No significant environmental effects are anticipated from this source.

9.8.2.3 Cooling and Reject (Brine) Water

Once discharged into the ocean, the cooling water would initially be subject to mixing due to ocean turbulence and some heat transferred to the surrounding waters. The volume of discharge from the rig will be small compared to the receiving waters and so the environmental effects of the elevated temperature of discharged waters is therefore predicted to be insignificant due to the large buffering capacity of the ocean. The plume will quickly lose heat and water in only a small area around the outfall will have a substantially elevated temperature (Swan et al., 1994). Upon discharge of brine to the sea, the brine is of greater density than seawater and would be expected to sink and disperse in the currents. It is expected that most pelagic species that would occur at the proposed drilling location would be able to tolerate short-term exposure to the slight increase in salinity caused by discharge of the brine. Both potassium and chloride are common in seawater and so the effect on the marine environment is considered negligible.

9.8.2.4 Discharge of Black and Greywater

The discharge of sewage, drainage water, runoff, and wash water during the appraisal drilling has been assessed as having a low environmental impact. The direct effects of these discharges include minor pollution from trace amounts of oils and chemicals, a slight increase in water temperature, and a marginal rise in nutrient levels within the water column. These changes may lead to localized population increases of certain marine organisms and potential disturbances to the marine environment.

Based on data compiled for cruise ships (EPA, 2008), the following estimates for greywater and blackwater production have been calculated (

Table 35):

Table 35-Estimation for Greywater and Blackwater Production

Discharge Type	Per Capita Production	Total Production(1)
Greywater	0.14-0.450m^3/day (Average 0.250m^3/day)	25m^3/day
Blackwater	0.0042-0.0102m^3/day (Average 0.032m^3/day)	3.2m^3/day

Note: (1) assuming a total of 100 persons on board platform and vessels and average per capita production.

Using the upper Biological Oxygen Demand (BOD) estimates for both greywater and blackwater, along with the calculated total production rates, the total daily BOD load from these wastewater streams is estimated at 30kg/day. This estimate does not account for any treatment processes that may occur prior to discharge. Given the rapid dispersion of waste in the marine environment and the temporary nature of these discharges, the overall environmental impact is considered negligible.

9.8.2.5 Discharge of Ballast Water

Ballast water is water taken up or released by a ship to provide stability. Ballast water quantities are adjusted on the open ocean to compensate for weather, fuel consumption, and for the overall safety of the ship and crew.

In Q3 2025, based on the current rig schedule, the rig will be towed to location and positioned over the programmed well centre. Following soft pinning and ballasting operations, the rig will jack up to the approved air gap of approximately 15-18m above mean sea level and begin to rig up, take on extra personnel, equipment, fluids and chemicals in preparation for spudding the well.

Discharge of ballast water from the drilling unit and vessel while in the area of operations may lead to the release of low levels oils, trace metals and chemicals into the marine environment.

Additionally ballast water is an identified method of transferral of introduced marine pests. When ships take in water for ballast in port, they also take in whatever organisms are present in the water. These organisms are then transported and are potentially introduced into the waters of the ports along the vessels' routes as ballast tanks are emptied each time

cargo is loaded. Discharge of ballast water can result in the release of non-native organisms with the potential to become a serious threat to native flora and fauna.

It is well documented that ballast water is a major pathway for aquatic species introductions around the world. Introduced non-native species can have dramatic economic and environmental consequences. Ballast water has been studied extensively worldwide, and numerous invasive species are attributed to this mode of introduction. Complete eradication is probably impossible. The best way to address these introductions is prevention and by following Australian and other best practice requirements for Ballast water discharge.

9.8.3 Ballast Water and Wastewater Management

- Conduct a Bio-Security Survey on the MODU prior to leaving Australian waters enroute the Chuditch location by a suitably qualified Bio-Security Surveyor (PGM Environment).
- Discharge ballast water outside the Exclusive Economic Zone (EEZ) in compliance with relevant regulatory requirements, including vessel hull inspections at ports and notification to authorities regarding disposal.
- Ensure vessels comply with Australian Ballast Water Management Requirements (AQIS).
- Direct oily water from deck washing and drainage systems to an onboard oily water separator before discharge. The oil concentration in discharged water must not exceed 15ppm, in accordance with the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (MARPOL requirements).
- Treat sewage using an onboard effluent treatment plant before discharge, in compliance with MARPOL Annex IV, ensuring no discoloration or floating matter.
- Macerate food waste to less than 25mm in diameter before disposal.
- Adhere to the Australian requirements for Ballast water discharge.

9.9 Noise and Disturbances

9.9.1 Source of Noise on Jack-Up Rig

The sources of noise are propeller movement, engine noise and mechanically generated vibration, Drilling Top Drive System, drill string and shakers and support vessel activities.

9.9.2 Potential Environmental Effects

Prior to drilling activities, the only source of non-natural noise and vibration will be transient vessel traffic via propeller cavitation, engine noise and mechanically generated vibration.

Noise sources during drilling are generated by MODU power generation units, mainly noise emanating from exhaust stacks and from noise generated from the Drilling Top Drive System, drill string and shakers and support vessel activities. Noise generated during the DST will be from flaring and support vessel activities. Typical noise levels produced by drilling campaign are detailed in Table 36 below.

Table 36-Typical noise levels associated with drilling activities

Vessel	Source pressure level (dB re 1µPa@1 metre)	Dominant frequency range (Hz)[1]
Offshore MODU[2] during drilling	117 @ 125m from MODU	<100
Support Vessel[3]	108 – 135 (without thrusters) 121 – 182 (with thrusters)	20 – 1000 20 – 1000
Helicopter[4]	-	<500
Fishing Trawler[5] (For reference)	158	100

(1) Frequencies measured maybe in 1/3 octave bands, octave bands or spectrum levels. Comparison is therefore prone to inaccuracy.
(2) Quoted from McCauley (1998)
(3) Quoted from Environmental Statement: Development of the Forvie and Jura Area (Total, 2004) "The Survey vessel engines and dynamic positioning thrusters are capable of generating sound at levels between 108 and 182dB re 1µPa at 1 mat dominant frequencies between 50 Hz and 7 kHz has the potential to expose sound sensitive marine fauna to localised changes in underwater noise levels". (Simmonds et al. 2004; McCauley 1998)
(4) Sound recorded from Griffin Venture FPSO (BHP Billiton 2006)
(5) Quoted in Oceans of Noise (WDCS, 2003)

In the Timor Sea, McCauley (1998) measured noise levels of 115-117dBA re 1µPa from a MODU at 405m and 125m respectively while the rig was drilling. The maximum audible range for a MODU was 11km (ideal conditions while drilling) and only 1–2km while not drilling. In the Otway Basin, Woodside (2002) measured maximum broadband noise of 145dBA re 1µPa emitted from a MODU at a distance of 5.1km during a 32-days drilling period (BHP Billiton, 2006). Drilling noise was dominated by sharp tones (<100Hz) with little high frequency.

Underwater noise generated through vessel positioning and movement and the drilling activity do not have the intensity and characteristics likely to cause physiological damage in marine fauna (Nedwell & Edwards, 2004; Hatch & Southall, 2009). In addition, the sound

energy levels generated from helicopters, vessels and drilling are considered relatively low intensity when compared to natural noise sources. In the operational area, the marine fauna most at risk from acoustic disturbance are marine mammals, as the auditory bandwidth of large whales overlap with the low frequency broadband noise produced by thrusters during vessel positioning and movement as well as active drilling. Impacts are likely to be limited to behavioural disturbance, as the noise levels likely to be produced by operations are well below proposed injury criteria for low frequency marine mammals (estimated at 230dB re 1µPa) (Southall et al., 2007) and injury (estimated at 179dB re 1µPa) (Southall et al., 2007).

Under normal operating conditions when the support vessel is idling or moving between sites, support vessel noise would be detectable only over a short distance. However, when the vessel is holding its position using bow thrusters and strong thrust from its main engine, noise may be detectable up to a few kilometres although this range of audibility will be reduced under windier (noisier) conditions (BHP Billiton, 2006).

While support vessel activities extend the area of impact, these activities typically occur for approximately 2% of the total drilling duration (McCauley in APPEA, 2005).

Noise emitted from helicopter operations is typically below 500Hz. Sound pressure in the water directly below a helicopter is greatest at the surface but diminishes with depth.

Reports for a Bell 214 (one of the noisiest Rotary wing aircraft used) indicated that noise is audible in the air for 4 minutes before the helicopter passed. The Helicopter is audible underwater for a period of only 38 seconds at a 3m depth and 11 seconds at an 8m depth (BHP Billiton, 2006).

Drilling activity will cause vibration of varying frequencies. According to Huang et al. (2023), vibrating noise during drilling is a low-intensity, non-impulsive sound of approximately 150dB re 1µPa rms at 1m. The environmental impact is intermittent for higher intensity vibration due to intervals of drilling activity interspersed with non-drilling periods and is a transient impact due to the duration of the project activities associated with construction of the Chuditch-2 well expected to be about 44 days in total.

The potential for the planned drilling program to affect fauna based on the above is considered transitory and marginal at most and likely to promote avoidance behaviours rather than inflict harm. On that basis SGBU propose not to conduct noise and vibration

studies for the EIA. SGBU will consider periodic noise surveys during the environmental monitoring phase should cetaceans or other species known to be affected by noise and vibration be observed within the 500-metre exclusion zone of the project and who do not adopt avoidance behaviours.

9.9.3 Mitigation Measure Noise

SGBU and drilling contractor will ensure that the sources of noise such as propeller movement, engine noise and mechanically generated vibration, Drilling Top Drive System, drill string and shakers and support vessel activities will adhere to manufacturers specification.

9.10 Light Emissions

9.10.1 Source of Light on a Jack-Up Rig

The sources of light are the artificial lighting used on the Rig. High-intensity light will be generated from the operating Rig for a period of approximately 40 days. Low-intensity light will be generated from the supply and standby vessels. The lighting levels are a consequence of providing safe illumination of work and accommodation areas and both MODU and vessels lighting is directed over the work area, which aids in limiting light spill to the marine environment. Light will also be generated during flaring activity although for staggered periods of time, not necessarily after dusk and for a total period of 30 hours, estimated.

9.10.2 Potential Effects on Environment

Light emissions have the potential to disturb light-sensitive marine fauna, specifically marine turtles, seabirds and migratory bird species, through localised attraction to light that may result in behavioural changes for exposure over time.

There is no practical method of estimating any change in behavioural change over the short duration for operations apart from Vessels and MODU ensuring that sighting reports are made of any persistent changes to normal flight patterns of seabirds and repeated sightings close to the MODU and vessels of Marine turtles and cetaceans as part of the environmental monitoring program and to minimise flaring. Flaring is expected to generate avoidance behaviours in the majority of species.

Vibration, noise, light and heat from the appraisal drilling and ship movements may cause disturbance to the marine life especially sensitive migratory marine species. Nevertheless, the effects are likely to be minimal due to the short duration of drilling program and the disturbance will stop by the end of the drilling.

The emission of underwater noise from drilling and vessel activity is not considered to be of sufficient amplitude to cause direct harm to marine life. There is, therefore, no requirement for marine observers or acoustic monitoring for standard drilling and vessel operations. Underwater noise from drilling and vessel activity may induce localised behavioural changes in some marine species, however, there is no evidence of significant behavioural changes due to drilling that may impact on the wider ecosystem.

The cumulative impact of increased background noise levels in the marine environment is an ongoing and widespread issue of some concern. The secondary and cumulative impacts in this case are considered negligible when compared to operations such as marine seismic surveys, use of active sonar, pile-driving ad offshore construction or even high intensity fisheries and vessel traffic.

Artificial lightings have the potential to disorientate and confuse hatchelling turtles, pregnant turtles and seabirds. Lights on the rig may result in marine life and seabirds concentrating in the immediate vicinity of the rig; however, the operation is short term and, therefore, the impact is not expected to be significant.

9.10.3 Mitigation Measures

- It is recommended that operational activities be limited to either side of November through to March when the sea turtles typically return to shore in order to nest hence minimise potential disturbance to the turtle migratory pathway; and
- Minimise unnecessary lights directed towards water and minimise the duration of Appraisal drilling.

The drilling activity is planned in Q3 of 2025 thereby limiting the potential disturbance to sea turtles.

9.10.4 Physical Presence of Rig

The impact to fishing and shipping operations caused by mobilisation of the rig was assessed to be of low importance. The direct effect will be the exclusion of fisheries and vessel traffic around the drilling area, with indirect impacts including economic costs and risk of collision. The use of support vessels will help prevent other vessels encroaching too close to the drilling operation and the declaration of 500m safety zone. Impacts to fisheries and vessels will also be minimised due to the short duration of the campaign. Interference to other sea users from these vessels will, therefore, be minimal. Damage to potential seabed artefacts from anchoring operations was also considered to be of low importance and the aesthetic/ visual impacts of the drilling operation are not considered to be significant.

9.11 Socio-Economic Impacts

9.11.1 Socio-Economic Development

Timor-Leste faces considerable challenges in developing its infrastructure and creating employment opportunities for young people entering the workforce. The development of oil and gas resources in offshore waters has been an important component of government revenues since the restoration of independence, funding many state services and resulting directly and indirectly in the creation of employment.

Article 5.4 of PSC-TL-SO-19-16 includes clear obligations for SGBU to provide some opportunity to suppliers based in Timor-Leste and give preference in employment to Timor-Leste nationals and permanent residents. There is limited opportunity to incorporate significant local content into the drilling program due to the nature of the work and the short duration of the program. However, SGBU endeavours to incorporate local content wherever feasible. For example, crew changes are intended to be conducted via helicopter based in Dili. SGBU will continue to liaise with Timor-Leste stakeholders to identify and develop local content opportunities, particularly if the Chuditch-2 appraisal well proves the economic viability of the project.

Socio-economic variables of interest identified in the EIA interdisciplinary team meeting are outlined in Table 37. These variables were identified through literature reviews and discussions with key informants.

Table 37-Socio-economic Variables of Interest

Variables of Interest	Description
Influx of temporary workers	There are expected to be some temporary workers in Timor-Leste and Darwin due to the development of the supply base with fuel arrangements. This will include preparation of the EIS/EMP/EBS study period, pre-drilling phase and the actual investigative drilling phase.
Disruption in daily living and movement patterns	There is the potential for impacts to daily living and movement patterns; these would mainly be indirect impacts in Timor-Leste and Darwin rather than direct impacts in the Timor-Leste EEZ area as it is ~ 184nm offshore.
Formation of attitudes towards the project	A number of NGOs in Timor-Leste would like to see more consultation with civil society in regard to petroleum related activities.
Change in occupational opportunities	This Project provides the potential for employment opportunities for Timorese and Darwin residents. With approximately 40 days of drilling occurring in the PSC SO-19-16 area there is the very limited potential impacts to fishing practices as it is ~ 184nm offshore. There is the potential for increased business to goods and service-related industries such as accommodation providers, food suppliers and Environmental consultancies in the short to medium term.
Effects on known cultural, historical, sacred and archaeological resources	There are customary rituals that are often conducted in Timor-Leste prior to fishing or other activities in the ocean. These should be considered prior to undertaking any investigative drilling activities, however, due to the distance offshore such customs are arguably non-relevant in this instance.

9.11.2 Potential Impacts and Mitigation Measures

9.11.2.1 Influx of Temporary Workers

Some of the operations like company office, engagement with environmental consultancies, employment of locally qualified engineers, geologists and permanent managerial and office support will have positive impact on the local economy. The exact number of temporary workers is unknown, however, some opportunities for temporary employment is expected. It is expected that a large number of workers engaged on the drilling and logistics phase will be workers of International / Australian nationality due to the specialist knowledge, training

and experience required. Due to the above factors and the very limited duration of the current drilling program, there is very limited practical scope to engage with and train local personnel to a level required to conduct activities in a high-risk environment such as offshore oil and gas appraisal drilling activities or in associated support services or to obtain the required offshore qualifications which would allow participation.

9.11.2.2 Disruption in Daily Living and Movement Patterns

Logistics services will be based in Darwin, Australia where equipment, fuel, water supply, etc. will be obtained and delivered to the drilling site. Service vessels will take on and discharge deck cargo at the Darwin location. The actual drilling will occur approximately 184 nm from the nearest Timor-Leste coastline. It is considered that the drilling campaign will have a negligible disruption to the local population's daily living and movement patterns.

Disruption in daily living and movement can be mitigated through:

- Development of OH&S policies and procedure;
- Notify appropriate maritime authorities of the drilling work prior to commencing;
- Monitoring conducted as outlined in procedures and by the HSE manager;
- Records showing appropriate authorities have been informed.

9.11.2.3 Change in Occupational Opportunities

It is expected that a large number of workers engaged on the drilling and logistics phase will be workers of International / Australian nationality due to the specialist knowledge, training and experience required for work in the offshore oil and gas sector. Due to the very limited duration of the current drilling program, there is very limited practical scope to engage with and train local personnel to a level required to conduct activities in a high-risk environment such as offshore oil and gas appraisal or in associated support services or to obtain the required offshore qualifications which would allow local participation.

Given that the majority of Timor-Leste fishing is of an artisanal nature where local fishermen, generally do not venture out of sight of the Timor-Leste landmass, it is considered there will be no impact to either artisanal or commercial fishing activities as the appraisal drilling location is approximately 184nm offshore, where commercial fishing activity is minimal or absent. The overall impact is expected to be low to non-existent. Nevertheless, accidental pollution—such as oil spills, improper waste disposal, or ballast water discharge—could negatively affect fisheries, should a major spill occur.

To mitigate potential impacts and maximize benefits, the following measures are proposed:

- Prioritize, where practical, local employment by actively sourcing workers from Darwin and Timor-Leste.
- Implement training programs where possible to enhance the skills of Timor-Leste's workforce.
- Ensure proper marking of drilling activities in accordance with OH&S procedures.
- Develop and enforce robust pollution and waste management plans.
- Maintain detailed records of any employment and training provided to workers from Timor-Leste.

9.12 Tourism

No known tourist or recreational fishing occurs in the area of the Chuditch appraisal well. Apart from the possibility of occasional passing private motor vessels, yachts or merchant vessels, there are no known tourism interests in the area. Thus, impacts on tourism activities are non-existent and not expected to occur.

Conclusion

This EIS has been conducted to evaluate the potential environmental impacts arising from the proposed appraisal drilling program. Generally, the assessment has been conducted based on the appraisal drilling activities. The findings of impact assessment and proposed mitigation measures may vary should there be any significant deviations of the drilling operational methods.

In conclusion, the assessment indicated that the existing environments within the project area are low in sensitivity. With the nature of the proposed appraisal drilling program, which is short term with no permanent structures, the impacts are considered temporary and localised.

9.13 Residual Impacts

9.13.1 Construction Appraisal Drilling Well

The drilling program involves the construction of Chuditch-2 appraisal well to evaluate the hydrocarbon presence, reservoir, and reservoir pressure.

The appraisal drilling well will be permanently sealed using down-hole cement plugs. All associated seabed infrastructure will be removed, and well casings will be cut below

the mudline and pulled vertically from the well bore. Any remaining subsea structures, such as casing remnants, represent residual seabed hazards, potentially interfering with fishing operations and trawling activities. To mitigate these risks, a comprehensive site clearance survey utilizing a Remotely Operated Vehicle (ROV) shall be conducted to confirm the removal of all drilling- related equipment and any drilling campaign related debris prior to the MODU moving off site.

9.13.2 Waste Management

Despite the relatively short duration of the drilling campaign, the deposition of drill cuttings on the seabed will result in physical changes to sedimentary characteristics. During active drilling, local benthic organisms will have limited opportunities for recolonization due to ongoing sediment disturbance but will repopulate rapidly once transitory disturbances are no longer present.

For waste materials transferred from the jack-up drilling rig to onshore storage facilities, segregation will occur based on waste classification. Non-hazardous combustible waste is typically incinerated prior to disposal in designated landfill sites. The incineration process generates ash residues, which contribute to localized atmospheric emissions, although the overall impact remains short-term. However, the disposal of incinerator ash in landfills presents a long-term to permanent environmental burden.

9.13.3 Oil Spill Risks

Residual oil pollution from appraisal drilling, well abandonment, or support vessel operations can persist in marine environments for extended periods. Petroleum hydrocarbons include a complex mixture of alkanes and polycyclic aromatic hydrocarbons (PAHs), with alkyl-substituted and multi-ring PAHs recognized as particularly toxic and persistent.

As spilled oil undergoes weathering, lighter hydrocarbons evaporate or degrade, leaving behind heavier PAH compounds that exhibit low solubility in water. While these PAHs may not contribute significantly to acute toxicity in waterborne solutions, their lipophilic nature allows for bioaccumulation in marine organisms, potentially leading to physiological damage. Additionally, even at sublethal concentrations, oil-derived compounds can alter marine species' behavioural patterns, affecting feeding and reproductive success. The Chuditch-2 field is a gas field and there is no prognosis of crude oil, minimizing the residual risk.

9.13.4 Greenhouse Gas (GHG) Emissions

Based on the estimated fuel consumption of 1,672m³ of diesel, 54.5m³ of jet fuel and 36.67mmscf of natural gas from the well testing for the proposed appraisal drilling program, the total GHG emissions are projected to be approximately 6,993 MT of CO_2-equivalent (CO_2-eq). While this emission volume contributes to global atmospheric carbon levels, its relative impact remains minor on a global scale. However, it is critical to acknowledge the cumulative effect of offshore hydrocarbon drilling activities on climate change and to implement strategies to minimize the carbon footprint through operational efficiencies and emission reduction technologies.

10. SOCIAL IMPACT ASSESSMENT

The baseline information regarding socio-economic factors is derived from secondary, publicly available and published sources. The sources are Government websites, public, Institutional publications, Government of Timor-Leste National Strategic Development Plan, World Bank 2023, basic sanitation facilities, WHO, UNDP, UNFPA, ILO, MAF.

Timor-Leste has made significant strides in rebuilding its social and economic components since the restoration of independence in 2002. This chapter provides an overview of the social components in Timor-Leste, including the status of the population, living standards, health indicators, and societal structures. Furthermore, it evaluates the potential impacts of oil and gas appraisal activities, such as the Chuditch-2 project, on employment, income levels, and infrastructure development.

In general terms, consideration can be given to the present status of the population, including demographics, population size and composition, living standards (including factors such as access to housing, clean water, and electricity) public health indicators (access to healthcare), and social aspects (community structures and local governance systems). The possible impact on employment can be assessed, along with the overall impact on local economies and any development of infrastructure, such as roads, schools, healthcare, and other such facilities that are propelled by the increased demand or investment.

10.1 Demographics and Population Composition

As of 2023, Timor-Leste's population is estimated at approximately 1.34 million people (World Bank, 2023), with a youthful demographic profile. Over 60% of the population is under the age of 25, reflecting high fertility rates averaging 4.2 births per woman (UNFPA, 2022). Figure 33 shows the distribution of the Timor-Leste Population from the Census in 2022. This demographic trend has implications for the country's labour force, education system, and social services. Rural areas account for about 70% of the population, while Dili, the capital city, is the primary urban hub. Ethnically, the population is diverse, with Austronesian and Melanesian influences, and there are over 30 local languages spoken, in addition to the official languages of Tetum and Portuguese.

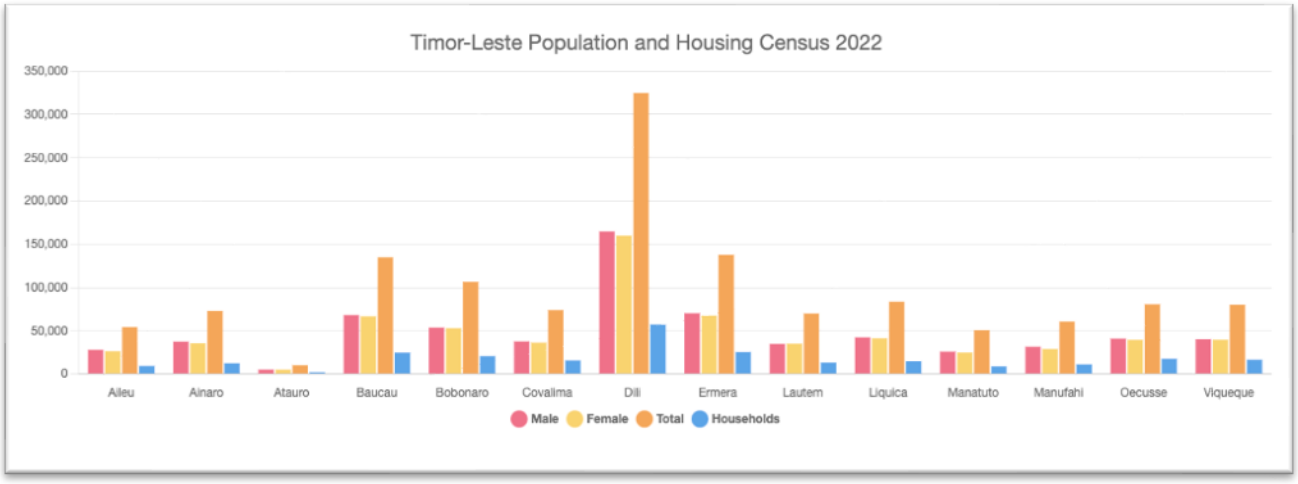


Figure 33-Timor-Leste Population Census 2022. (Source: INE IP., 2022)

10.2 Living Standard

While Timor-Leste has made progress in improving living standards, significant challenges still remain.

10.2.1 Housing

The Timor-Leste Housing 2022 Census (Figure 34) reported that 55.9% of households lived in accommodation units with concrete or brick walls. Palm trunk (bebak) is the second-most common wall material used. In rural areas, 19.5 percent of all housing units have palm trunks as wall material. In urban areas, this is much less (6.9 percent). About one in seven Timor-Leste housing units have bamboo walls (14.4 percent). While this is 19.6 percent in rural areas, just a few houses in urban areas use bamboo as construction material for walls (1.2 percent).

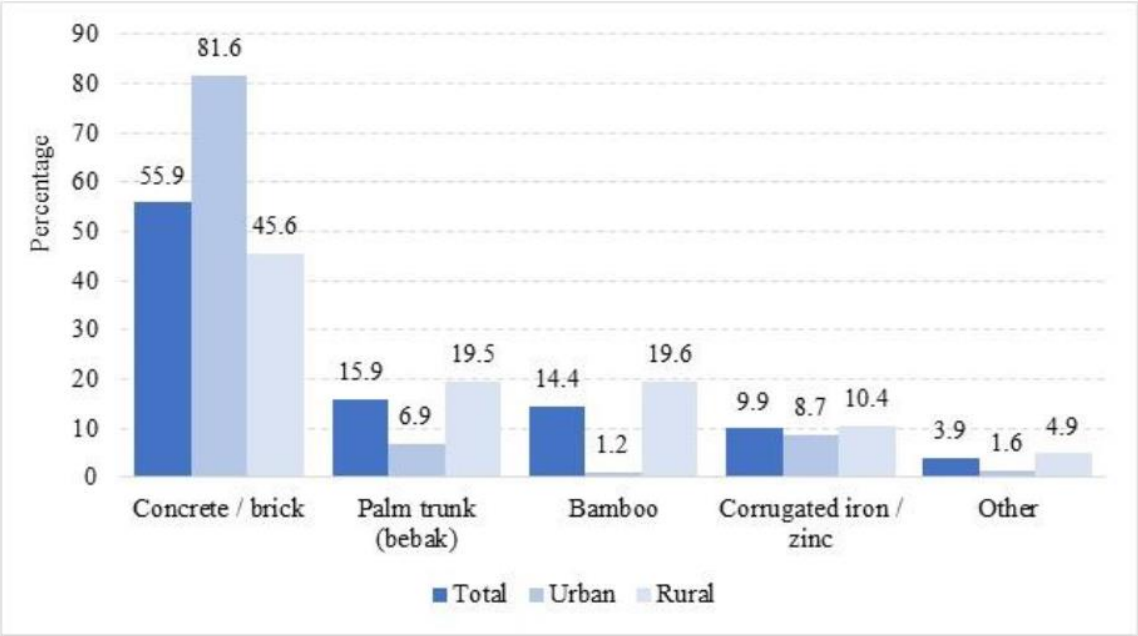


Figure 34-Timor-Leste Housing Census 2022 (Source: INE IP., 2022)

10.2.2 Clean Water and Sanitation

The criteria to classify drinking water services are 'improved' or 'unimproved' type of drinking water sources, accessibility of drinking water on the premises, the time required to collect drinking water, including queuing, the availability of water if needed and absence of contamination.

An improved drinking water source can deliver safe water through its design or construction. The following types of water supplies are considered a source of improved drinking water: piped supplies and non-piped supplies (such as boreholes, protected wells and springs, rainwater, and packaged or delivered water, e.g. by tanker trucks). Unimproved water sources do not protect against bacterial and chemical contamination. These sources include rivers, streams, irrigation channels and lakes.

The Clean Water and Sanitation Census 2022 (Figure 35) reported for drinking water source that the most occupied housing units rely on public taps or public piped water (39.5%). Only a minority of 10.2 percent of all housing units have piped or pumped water in the house, and 11.0 percent have a private water source in the yard. Bottled water and water delivered by a water vendor account for 8.8% and 2.3% of all housing units, respectively. The graph in Figure 36 shows that people in 8.7% of all housing

units depend on rivers, streams, lakes, ponds and irrigation channels to get drinking water, and 4.3% obtain their drinking water from unprotected wells and unprotected springs. This means that unimproved drinking water sources are used in 13.0% of all housing units.

Approximately 75% of households have access to improved drinking water sources, but only 46% have access to basic sanitation facilities (WHO/UNICEF Joint Monitoring Program, 2022)

Lack of proper sanitation is a major contributor to waterborne diseases, particularly in rural communities.

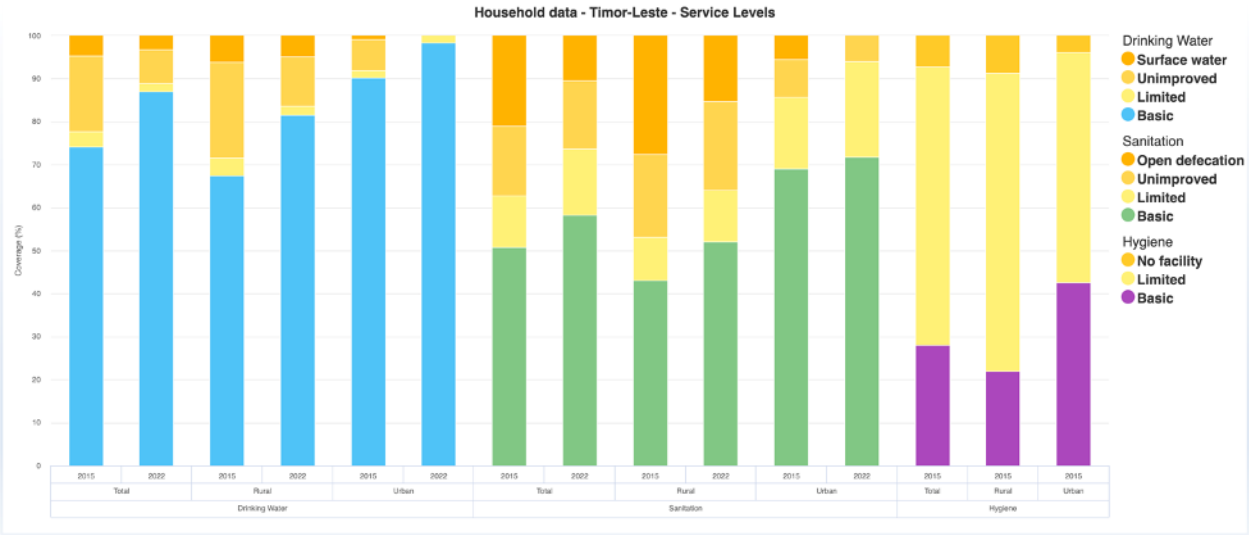


Figure 35-Clean water and sanitation census 2022. (Source: WHO/UNICEF, 2022)

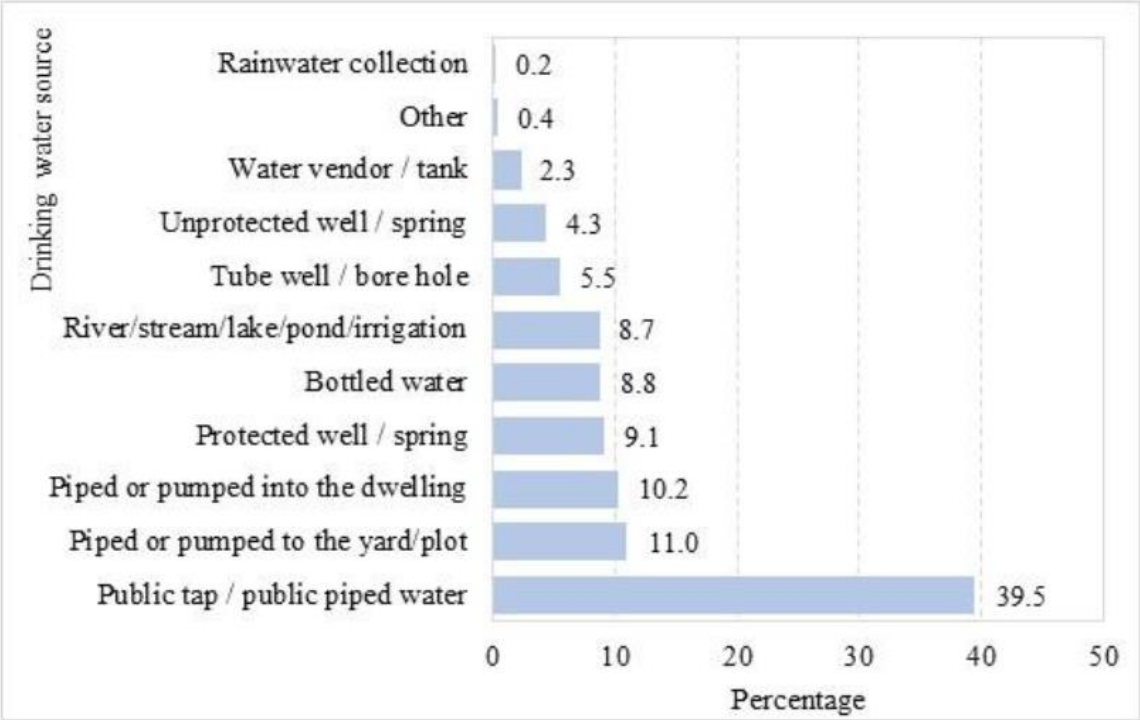


Figure 36-Drinking water source (Source: INE IP., 2022)

10.2.3 Electricity Access

As of 2024, Timor-Leste has achieved a national electrification rate of 99%, according to *Eletricidade de Timor-Leste* (EDTL). This milestone reflects substantial government efforts to expand electricity access across the country. Currently, only one suku, Betulau, in the post-administrative area of Lequidoe, Aileu Municipality, remains under construction. Furthermore, 96% of aldeias nationwide are now connected to the electrical grid, marking significant progress in enhancing electricity access for both urban and rural communities.

This achievement aligns with the National Strategic Development Plan (2011–2030), which prioritizes universal access to reliable, 24-hour electricity by 2030. The plan emphasizes rural electrification as a cornerstone of sustainable development, aiming to reduce inequalities and foster economic growth across Timor-Leste (Timor-Leste National Strategic Development Plan).

Despite these advances, challenges persist, particularly in rural areas, where intermittent power supply hampers productivity and quality of life. To address these challenges, the government and international organizations have launched targeted initiatives. For instance, the UNDP's Accelerating Clean Energy Access to Reduce Inequality (ACCESS) project,

funded by the Korea International Cooperation Agency, has been pivotal in improving energy access for vulnerable communities. Between 2020 and 2023, the project focused on enhancing sustainable electricity access in 25 villages across Dili (Atauro), Bobonaro, and Manatuto municipalities, aiming to improve livelihoods and reduce energy inequality (UNDP ACCESS Project).

Additionally, the UNSDG's Solar-Powered UN House project highlights Timor-Leste's commitment to greener and more sustainable energy solutions. This initiative showcases the potential of renewable energy sources, such as solar power, to address chronic energy challenges and reduce dependency on expensive and environmentally harmful diesel generators (UNSDG Solar-Powered UN House).

The government is further promoting renewable energy technologies, including micro-hydro, solar panels, and biofuel generators, particularly in remote areas. Communities are encouraged to adopt these solutions, with opportunities to produce surplus energy for sale to the national grid.

While Timor-Leste has made commendable progress toward electrification, continued efforts are necessary to ensure the reliability, affordability, and sustainability of electricity, particularly in rural areas. Strengthening infrastructure and advancing renewable energy initiatives will be critical to achieving the country's long-term development goals.

10.3 Health Status

Public health indicators in Timor-Leste highlight areas of progress and ongoing challenges.

10.3.1 Life Expectancy

Life expectancy in Timor-Leste has seen significant improvement, increasing to approximately 70 years as of 2023. This progress reflects advancements in healthcare, education, and living conditions within the country. Despite these gains, life expectancy in Timor-Leste remains lower than the global average, which was 73.4 years in 2019 according to the World Health Organization (WHO).

The improvement is attributed to investments in public health infrastructure, vaccination programs, and reductions in infant and maternal mortality rates. However, challenges persist, including access to healthcare in remote areas, nutritional deficiencies, and the burden of communicable and non-communicable diseases. Continued efforts in addressing these issues are essential to closing the gap with the global average.

10.3.2 Healthcare Access

Timor-Leste faces significant challenges in ensuring equitable access to healthcare, particularly for rural communities. While healthcare infrastructure is concentrated in urban centres like Dili, rural and remote areas remain underserved. This geographic disparity greatly affects access to skilled healthcare, with only 40% of births in rural areas attended by skilled health personnel, compared to 85% in urban settings.

10.3.3 Resource and Workforce Challenges

Health facilities in Timor-Leste often operate with limited resources, including insufficient medical equipment, essential medicines, and infrastructure such as clean water, electricity, and transportation services. Rural health posts, which are typically the first point of care for many communities, are especially affected by these shortages.

Moreover, the country faces a critical shortage of skilled healthcare professionals, including doctors, nurses, and midwives. This shortage is compounded by challenges in recruiting and retaining qualified staff in rural areas. Many healthcare workers prefer urban settings due to better living conditions, professional opportunities, and access to education for their families.

10.3.4 Maternal and Child Health

Maternal and child health indicators highlight the need for targeted interventions. Although progress has been made since independence in 2002, maternal mortality remains high, with 142 maternal deaths per 100,000 live births in 2020 (World Bank). Neonatal and under-five mortality rates are also higher in rural regions (41 per 1,000 live births) due to limited access to antenatal care, skilled delivery services, and postnatal care (World Bank, 2023).

While Timor-Leste has made notable progress in rebuilding its healthcare system post-independence, significant disparities remain. Achieving universal healthcare access requires sustained investments in health infrastructure, human resources, and community outreach programs. Addressing these challenges is critical to improving health outcomes, particularly for women and children in rural areas.

10.4 Education

Timor-Leste's education system comprises six years of primary education, followed by three years each of lower and upper secondary education, totalling 12 years of formal schooling.

As of 2015, the country had 106 secondary schools, with 61 public and 45 private institutions. The net attendance ratio for secondary education stood at 32.8%, with a higher participation among females (35.9%) compared to males (29.9%).

In tertiary education, the net attendance ratio was 16.3%, indicating that a modest proportion of the population pursued higher education. A significant concentration of tertiary students resided in Dili municipality, accounting for 66.7% of the total higher education student body.

Additionally, the Timor-Leste government has committed to supporting students through initiatives through the Human Capital Development Fund, which allocated at least $150,000 in 2023 to assist up to three Timorese students in pursuing studies in the United States. Furthermore, the collaboration with development partner's support students to study in Europe, Australia, New Zealand, China, Japan, etc.

These collaborative efforts between the government and international partners aim to develop a skilled workforce capable of contributing to Timor-Leste's ongoing development, aligning with the educational objectives outlined in the SDP 2011–2030.

Despite these advancements, several challenges persist. A significant issue is the shortage of qualified teachers; many educators have only completed secondary education, with only half meeting the minimum qualifications for teaching.

This lack of qualified teachers contributes to high repetition rates, particularly in early grades. For instance, a 2009 assessment found that over 70% of Grade 1 students were unable to read a single word in Portuguese or Tetum, though this improved to 40% by the end of Grade 2.

Infrastructure deficits further hinder educational access, especially in rural areas. Ageing facilities, insufficient classrooms, and limited educational resources contribute to high dropout rates and absenteeism.

Additionally, language diversity poses challenges, as instruction is primarily in Portuguese and Tetum, which may not be the first languages of many students.

Efforts to address these challenges include government initiatives and international partnerships aimed at improving teacher training, updating curricula, and enhancing educational infrastructure. However, sustained investment and comprehensive strategies

are essential to overcome these obstacles and ensure quality education for all Timorese children.

10.5 Transportation Infrastructure

Infrastructure plays an important role in supporting economic and social development. The Government of Timor-Leste has improved the transportation infrastructure in general. However, there are many challenges due to climate change, low maintenance and limited human resources to maintain infrastructure.

The Timor-Leste Strategic Development Plan 2011–2030 outlines a comprehensive vision for enhancing the nation's transport infrastructure across land, air, and maritime sectors. The plan emphasizes the critical role of a robust transportation network in facilitating economic growth, social development, and national integration.

Timor-Leste's transportation infrastructure encompasses land, air, and maritime sectors, each presenting unique challenges and ongoing development efforts.

10.5.1 Land Transportation

The nation's road network spans approximately 6,041 kilometers, with about 2,600 kilometers paved and the remainder unpaved. The condition of these roads is often inadequate, hindering efficient transportation. Public transport primarily consists of privately operated minibuses, known locally as *microlets*, which serve various routes without formal schedules. Recent initiatives, such as the Timor-Leste Branch Roads Project, aim to improve road connectivity by linking key towns and enhancing access to potential tourist destinations like Mount Ramelau.

10.5.2 Air Transportation

The country operates several airports, with Presidente Nicolau Lobato International Airport in Dili being the primary hub for international flights. This airport accommodates flights to destinations including Darwin, Denpasar, and Singapore. However, limitations such as a short runway and lack of night-time landing capabilities restrict operations to daylight hours. Other airports, such as those in Oecusse, Baucau, and Suai, primarily handle domestic flights and are less equipped for international traffic.

10.5.3 Maritime Transportation

Maritime transport is vital for both domestic and international trade. The Port of Dili has historically been the main international cargo reception port, but its capacity has been insufficient to meet import needs. To alleviate this, the Tibar Bay Port was developed and began operations on September 30th, 2022, aiming to handle all cargo shipping and improve trade efficiency. Additionally, ferry services operate between Dili and regions like Oecusse and Atauro, providing essential connectivity for passengers and vehicles.

10.6 Religion

Timor-Leste has no official state religion and the government values different religious views. Catholicism however is the dominant religion of Timor-Leste following centuries of Portuguese occupation. Protestant, Animist and Islamic have also been practiced by Timorese. Many Timorese hold animistic beliefs, where traditions and old animistic cultures are still attached in some rural areas. However, animistic traditions are more cultural rather than religious.

10.7 Social Structures and Local Governance

Timor-Leste's community structures are deeply rooted in traditional systems, with customary practices ("adat") playing a pivotal role in social cohesion and dispute resolution. Local governance operates through village-level councils ("sucos"), which are essential for implementing development programs and resolving conflicts. These councils work alongside formal administrative systems established by the national government, ensuring localized decision-making and community engagement.

10.8 Social Structure and Language

Timor-Leste consists of diversity of ethnic groups that speaks more than 30 languages as well as Bahasa Indonesia and Portuguese has been used across the territory with some of the larger language groups being. Timorese largely speak Tetum, Mambae, Portuguese, Bahasa Indonesia, Tokodede, Makasae, Kemak, and Bunak. Among those languages, Tetum and Portuguese are claimed as the official languages in Timor-Leste for those living around Dili and the neighbouring northern coast.

10.9 Cultural Components

10.9.1 Traditions

Timor-Leste traditions are strongly related to mythology and verbally spread from generation to generation. The tradition is dominated by animist spiritualism that believes the spirits of the dead people should be worshiped. The spirits, named as Lulik, are on shapes and objects such wells, streams, stones, and animals.

A significant tradition of Timor-Leste is *Tais* weaving. It is the textile of the country that expresses the beauty and ancient traditions of Timor-Leste, which is mostly crafted by women. *Tais* has been widely worn for dances, religious gatherings and special rituals in Timor-Leste.

Music and dance in Timor-Leste have been strongly influenced by Portuguese and Indonesian cultures, with the most popular dance namely *Likurai*. Performed by women, this is a welcoming dance for men back to their homes after the war.

10.9.2 Cultural Heritage

Cultural heritage may thus relate to valuable sites, whether these are related to maritime heritage, traditional fishing practices, or indigenous systems of knowledge. The analysis of the cultural impact by identifying all places featuring cultural significance and analyse the potential influence of a project on such an area. The cultural heritage sites might include any of the following:

Maritime Heritage: Sites related to the sailing tradition, Traditional fishing practices form part of the culture and employment of local communities, and Indigenous knowledge systems manifest themselves in the unique practices tied to land and sea.

Cultural Impact Assessment: In terms of marine heritage in the vicinity of the drilling activity, there are no known significant heritage or archaeological sites, shipwrecks or marine heritage sites. In addition, the people of Timor-Leste still carry out traditional rituals prior to conducting activities in the ocean.

11. ECONOMIC ASSESSMENT

These components address the human economic activities and industries that could be impacted by the project.

Traditionally, Timorese agriculture consisted of subsistence farming: growing corn, rice, cassava, millet, and sweet potatoes. Other products such as palm and betel nut are also important. Coffee plantations are an important source of income for the Timor-Leste economy. Forest products such as sandalwood have had significant value; however, due to the near extinction of relevant species such wood products are protected and trade is controlled by the government. Farming of buffalo, cattle, pig and chicken are important for the economy of rural communities. Overall, the agriculture industry is limited in Timor-Leste, with a lot of imported foodstuffs.

The Government of Timor-Leste is attempting to promote tourism, which has grown at a slow but steady rate since the covid pandemic, and tourism presents opportunities for further economic growth. In the fisheries sector, Timor-Leste possesses substantial resources, yet this sector is underdeveloped and currently generates relatively economic contribution to the country.

The offshore oil and natural gas deposits in the Timor Sea present significant potential for the mineral and energy industry to support the future economic growth of Timor-Leste. The development of these resources, both offshore and onshore, has contributed significantly to state revenues, particularly from the Bayu Undan field.

Timor-Leste's economy has experienced fluctuations in recent years. In 2022 according to World Meters, the country's nominal Gross Domestic Product (GDP) was approximately $3.16 billion, with a real GDP of about $2.25 billion after adjusting for inflation. This represented a significant decline from the previous year, with a real GDP growth rate of - 17.49% in 2022.

Looking ahead, the Asian Development Bank (ADB) forecast GDP growth of 3.1% in 2024 and 3.9% in 2025, indicating a potential economic recovery. Based on World Bank data, Timor-Leste’s GDP per capita was estimated at $1,502.50 as of 2023.

The economy is heavily reliant on oil and gas revenues, which poses challenges due to the finite nature of these resources. Efforts to diversify the economy are ongoing, with a focus on sectors such as agriculture, tourism, and manufacturing.

In terms of trade, Timor-Leste's imports were valued at $850 million in 2020, with refined petroleum, cars, cement, delivery trucks, and motorcycles being the main imported goods. The primary import partners were Indonesia (27.1%), China (23.2%), and Singapore (8.97%).

The country faces socio-economic challenges, including poverty and unemployment. Efforts to address these issues are critical for sustainable development.

For a comprehensive analysis of Timor-Leste's socio-economic components, it is essential to consider these economic indicators alongside factors such as education, healthcare, infrastructure, and governance.

The oil and gas sector is a critical component of its socio-economic landscape. The potential development of the Chuditch project would significantly impact the country and support national development. The royalties and taxes predicted would go into the government's budget to fund education, health and infrastructure. Development would also create jobs in maritime logistics, engineering and maintenance and related industries such as transportation, catering and accommodation. Offshore drilling also boosts the economy through increased demand for local businesses and services and a multiplier effect that increases household incomes and consumer spending. These are key to diversifying and strengthening Timor-Leste's economy and broader economic resilience.

11.1 Employment Sectors

The employment sector in Timor-Leste reflects a developing economy characterized by high informality, sectoral imbalances, and ongoing challenges in job creation. According to Trading Economics (2023), the overall unemployment rate in Timor-Leste was 1.8% in 2022 and 2023, a relatively low figure compared to global averages. However, this does not account for the high levels of underemployment and informal labour, particularly in rural areas. Youth unemployment remains a major issue, with a rate of 12.31% among individuals aged 15–24 as of 2019. Many young people struggle to transition into formal employment due to limited opportunities and inadequate skills training.

Additionally, the International Labour Organization (ILO, 2021) reported that Timor-Leste's labour force participation rate (LFPR) is 30.5%, which is low for a developing nation. This figure reflects significant gender disparities, with men participating at a rate of 36.9%

compared to 24.2% for women. Many women are engaged in unpaid domestic work or informal agricultural activities, which limits their participation in the formal economy.

Employment in Timor-Leste is primarily concentrated in sectors such as services, agriculture, and industry. According to the ILO (2021), the services sector is the largest employer, accounting for 59.1% of the workforce and including areas such as education, healthcare, public administration, and retail. The agriculture sector employs 26.9%, focusing on subsistence farming of crops like coffee, maize, and cassava. The industrial sector accounts for 13.5% of employment and is driven by construction, manufacturing, and extractive industries. Despite its relatively small workforce share, the industrial sector is vital for infrastructure development and economic diversification.

The oil and gas industry is a significant employer in Timor-Leste. Employment opportunities from future developments like Chuditch will be both direct and through support industries such as transport and logistics for skilled and unskilled labour.

In terms of economic contributions, the AMAN Alliance (2023) reported that private-sector employment in non-oil-producing companies contributed $590.2 million to the GDP in 2023. The retail/wholesale trade and construction sectors were key contributors to this growth. Private sector employment grew by 3%, with approximately 62,500 people employed in 2023, reflecting a modest improvement in job creation.

To address the challenges in the employment sector, the government has prioritized strategic economic diversification as outlined in the Strategic Development Plan (2011–2030). This includes reducing reliance on oil revenues by promoting agriculture, tourism, and manufacturing, which are expected to generate sustainable employment opportunities. Investments in infrastructure projects, such as road networks and construction, are also being prioritized to stimulate economic activity. Human capital development is another key focus, with vocational training and education initiatives being implemented in collaboration with organizations like ILO to improve workforce skills and align them with market demands.

Despite these efforts, challenges such as high levels of informal employment, limited opportunities for youth, and gender inequality persist. Addressing these systemic issues remains critical to achieving sustainable economic growth and improving livelihoods in Timor-Leste. The government's focus on education, infrastructure, and economic

diversification offers a pathway toward fostering a more inclusive and resilient labour market.

A World Bank report of Unemployment Rate (Figure 37).

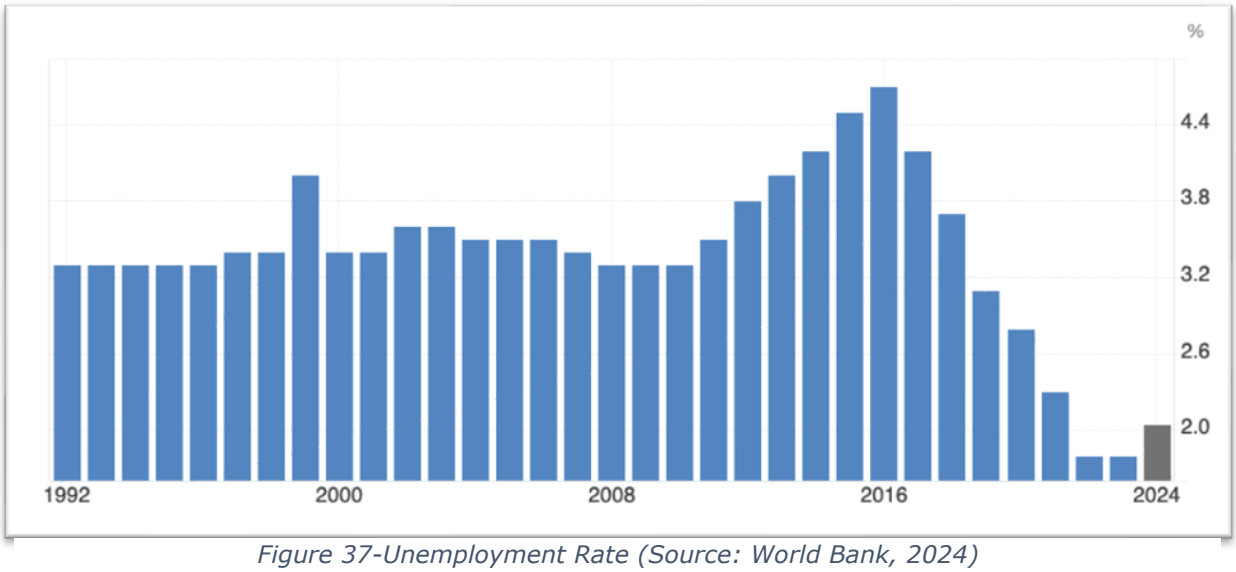


Figure 37-Unemployment Rate (Source: World Bank, 2024)

11.2 Fishing

Despite being relatively under-developed, the fishing sector is still an important part of Timor-Leste's economy and sustenance, with approximately 40,000 individuals directly engaged in the sector. The nation's waters, part of the Coral Triangle, are rich in marine biodiversity, supporting both artisanal and small-scale fisheries. The number of households engaged in aquaculture / fisheries activities is illustrated in Figure 38.

Fisheries are a major part of the local economy in the coastal areas. It is of great economic importance since fishing provides a source of livelihood and ensures food security, besides aiding in artisanal fisheries and commercial fisheries, which assist the coastal economy. Artisanal fishing, in a traditional manner, characterizes catches in the region, together with a little commercial fishing targeting tuna and mackerel among other species. Their economic contribution, be it at local incomes or market contributions, is important, and as such, they are vital in securing the livelihood of the communities. However, it may destroy fishing grounds, cause habitat contamination, and add another player that competes for resources. This also includes mitigation through compensation programs, continued monitoring, and liaison with local fishermen for resolution of issues that will help minimize conflict.

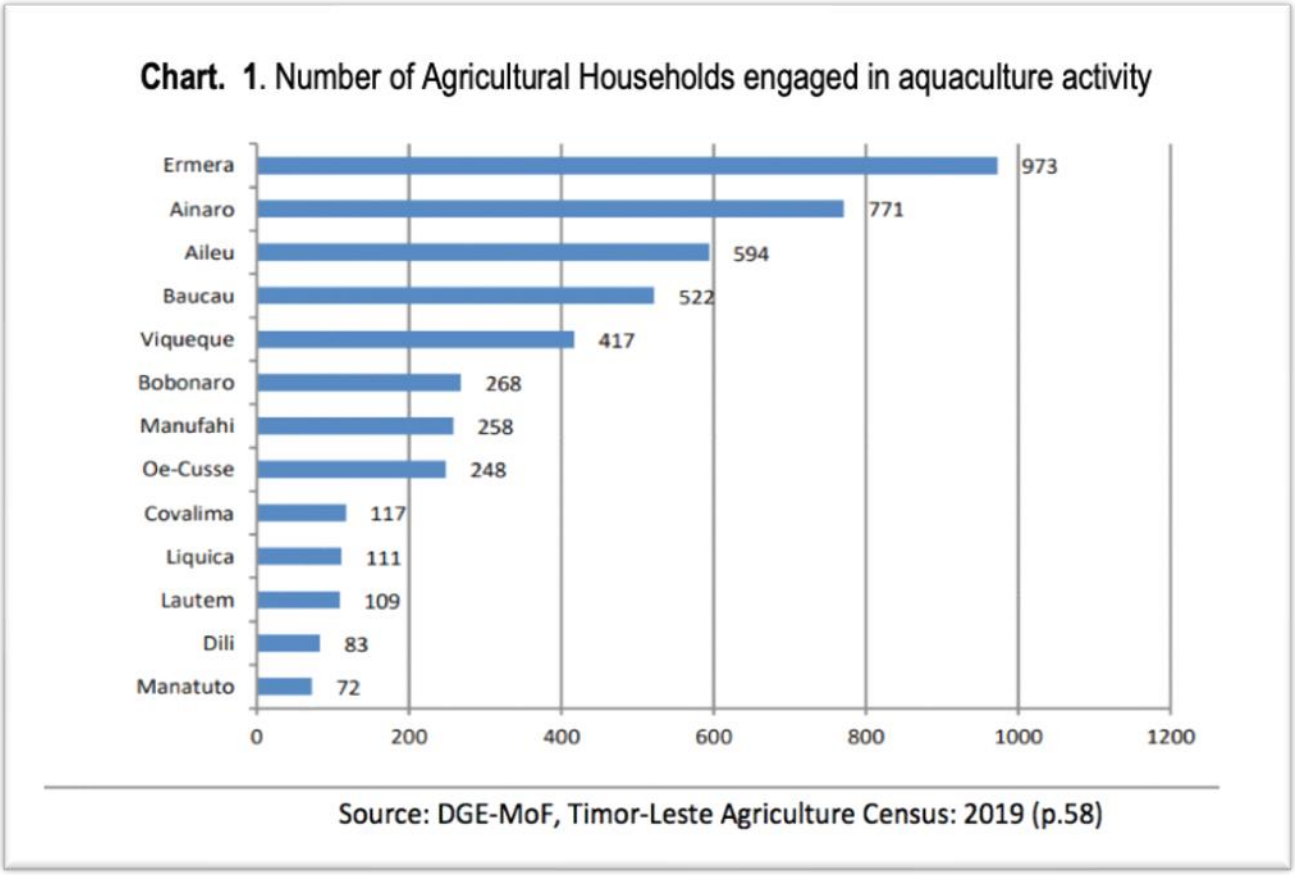


Figure 38-Number of Agriculture Households engaged in aquaculture activity. (Source DGE-MOF, 2019)

Artisanal fishers primarily use handlines, gillnets, and traditional traps to target species such as reef fish, tuna, and mackerel. These activities are vital for food security, as fish constitute a primary protein source for the population.

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 deep-water snappers for their livelihoods. The DNFA estimates that for over half the 20,000 fishermen of Timor-Leste, fishing is the main source of food and income many individual, small-scale operators with small boats catch a range of fish mostly sardines. According to fish production data from the National Directorate of Fisheries and Aquaculture in ATSEA Program Socio Economic Impact Assessment report (2011), there were an estimated 2,889 tonnes of fish (with equivalent value of around US$ 5.8 million) landed in Timor-Leste in 2005. Dili

was the most active fishing district, dominating the country's fish production and seaweed export, with limited fishing from the south coast towards the Contract Area.

There are 739 species (234 genera, 61 families) of reef fish and expected to predict 921 species of coral fish record in Timor-Leste. The site diversity ranged from 64 to 293 species/site with an average of 210 species/site.

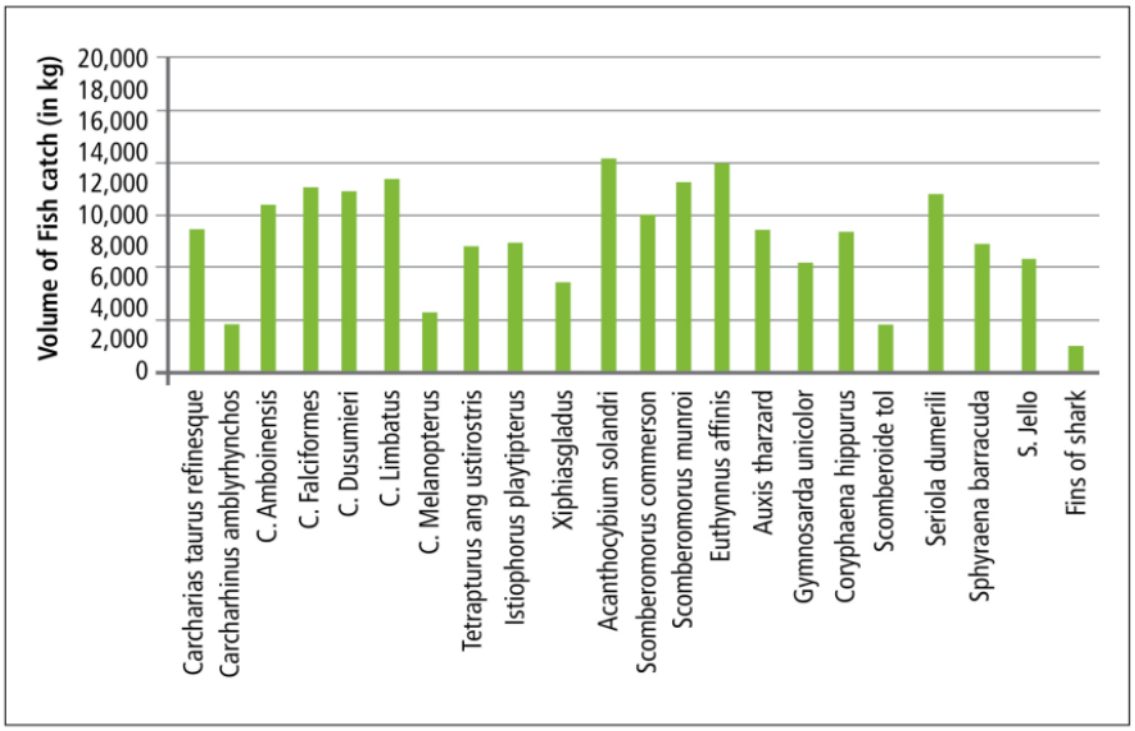
The coral Fish Diversity Index predicts 921 species. Sites with the highest fish diversity included Atauro Island with barrier reefs (293), Loikere (271), Ete Asa Lepek (259), West Jaco Island (249), and Tenu in Lautem (243). Several new fish species were also collected including Chrysiptera caesifrons and Eviota santani.

Many of the species listed for Timor-Leste are found throughout the tropics and are important commercial species, such as the tunas (The Big Tuna, Thunnus obesus) listed as threatened species, mackerels and snappers. Fish densities in the region of the contract area 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 utilized in traditional and commercial fisheries occur in the deeper offshore areas.

Some figures that give the efforts of Fishery in Timor-Leste:

- Volume of Fish catch (Figure 39 as Chart 2).
- Small scale fishing area in Timor-Leste (Figure 40).
- Fish catch Composition per Area (Figure 41).

Chart. 2. Volume of fish catch longimanus



Source: MAF, 2017.

Figure 39-Volume of fish catch. (Source: MAF, 2017)

In the Timor-Leste Sea, it is estimated that more than 239,460 tons of fish or equivalent to $1.2 billion were stolen through illegal fishing.

To ensure sustainable fishing practices, the government has implemented several regulatory measures. Joint Ministerial Order No. 11/GM/2015 establishes minimum sizes and weights for taking of species, aiming to prevent overfishing of juvenile stocks. Additionally, Joint Ministerial Order No. 18/MAP/MCIA/II/2017 lists protected aquatic species, prohibiting their capture to preserve biodiversity. The implementation of a Satellite System for Monitoring Fishing Vessels (VMS) under Decree-Law No. 21/2008 further enhances the management of fish stocks by enabling effective monitoring, control, and surveillance of fishing activities.

Figure 40-Small-scale fishing area in Timor-Leste. (Source: Ship Traffic)

Despite these efforts, challenges persist, including illegal, unreported, and unregulated (IUU) fishing, which threatens marine ecosystems and local livelihoods. In response, Timor-Leste has taken steps to strengthen its commitment to combating IUU fishing by approving accession to the Agreement on Port State Measures, as outlined in Government Resolution No. 8/2023.

The Peskas platform, an open-source web portal, provides data and insights on fisheries in Timor-Leste. Initiated in 2016 in partnership with the Ministry of Agriculture and Fisheries, Peskas uses catch data collected by local enumerators and vessel tracking data to show fishing trends over time and space. This near-real-time monitoring system focuses on small-scale fisheries and supports sustainable management practices.

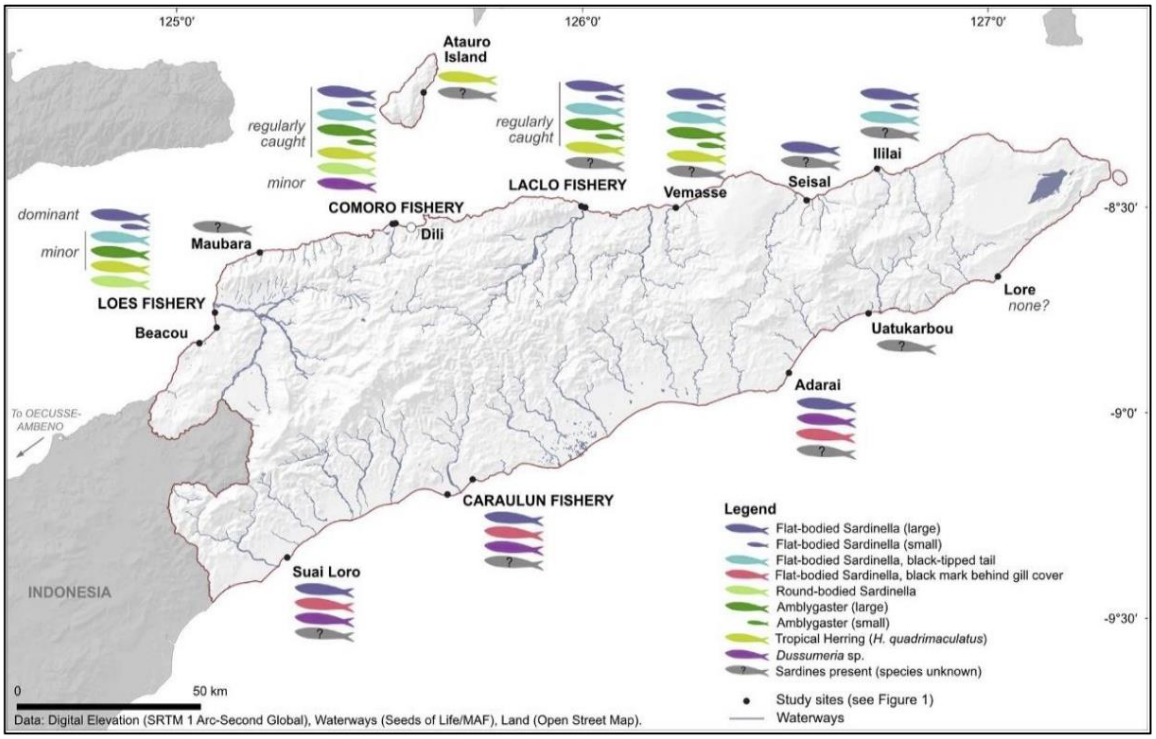


Figure 41-Fish catch composition per area. (Source: Hunnam et al., 2021)

11.3 Tourism

Though the Chuditch appraisal well project is an offshore project, its impact on the tourism industry, mainly on marine-based tourism activities of diving, snorkeling, and eco-tourism are considered.

There are no known impacts to tourism associated with the Chuditch location which is 184Nm offshore and in a minimum of 65m of open seas. Aquatic and Eco tourism is predominantly a coastal or near coastal waters activity. The only credible impact considered is that of environmental pollution resulting from an unplanned spill or well control event, considered highly unlikely with a gas well.

Tourism is one of the Government of Timor-Leste's tools for ensuring economic and socially sustainable development. The Government of Timor-Leste has officially published a website providing information related to tourism in Timor-Leste. This has been a stepping-stone for the country to introduce Timor-Leste worldwide through the website.

Marine tourism has been identified as a potential economic growth area for Timor-Leste, particularly along the north and east coasts, and could deliver social and economic benefits

through employment. Some ecotourism, including cultural tourism in coastal areas, in interaction with marine wildlife (dolphins, whales) fishing competitions and diving outfits already exists; however further development of these industries is reliant on improved infrastructure and services (Bateman & Bergin, 2011). In northern Australia, commercial marine tourism is an important industry although a small component of the overall tourism sector. Activities include charter fishing, diving, snorkelling, whale mammal watching and visitations on luxury cruise boats around the Kimberley archipelago and NT coast to view sparsely inhabited pristine marine and coastal region. This industry is expected to grow over coming years (DEWHA, 2008b). In the northern region, the marine tourism industries are largely associated with recreational fishing ventures which are projected to increase both in terms of effort, numbers and potentially movement from coastal to offshore areas (Fernander and Grainer, 2010 - ATSEA Program Socio Economic Impact Assessment report 2011). The cruise shipping sector has seen significant growth in northern Australia, particularly through Darwin. There are no known significant heritage or archaeological sites, shipwrecks or marine heritage sites in the vicinity of the survey/drilling area. There is no regular passenger vessel passing by the Chuditch Field.

11.4 Seaport and Shipping

Shipping into and out of Timor-Leste is through the port of Dili, with a relatively limited but growing number of vessels. However, administration of shipping is underdeveloped. A new port has recently been completed in Tibar, Liquiça municipality, 2km to the west of Dili and has been operating since November 2022. It is estimated that this new facility will lead to an increase in shipping traffic to Timor-Leste. In northern Australia, the major ports (Darwin, Dampier, Broome, Weipa, Karumba, Nhulunbuy) are experiencing increased activity due to expansion in the resources sector and exports of major commodities (Iron-ore, natural gas and other petroleum products, lead, zinc, manganese and copper) (DEWHA 2008A & 2008B). A number of private ports have been established in Australia, associated with the resources sector (e.g., in areas adjacent to Gove, Groote Eylandt and McArthur River in the Northern Territories) with major expansion in ports having been undertaken for gas developments. There is almost a certain amount of traffic associated with offshore support vessels associated with oil and gas industry production and exploration. An increase in shipping and port expansion associated with the growth of the

resources sector in the region has potential implications for the marine environment (DEWHA 2008b). Marine transport activity in the Timor Sea region is shown in Figure 42.

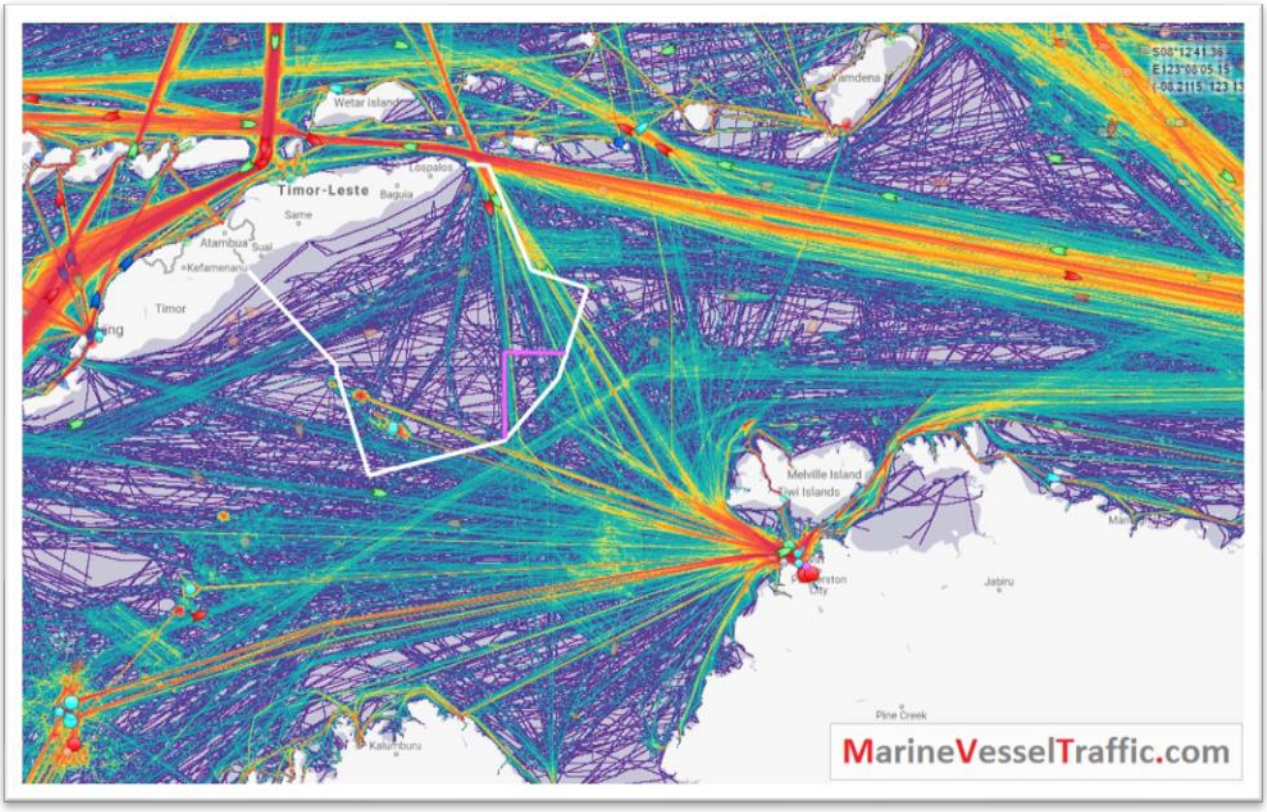


Figure 42-Details record of fishing and shipping activity in Timor-Leste. (Source: Marine Vessel Traffic)

11.5 Agriculture and Forestry

Timor-Leste is famous for its coffee variety named Timor Hybrid and also known as the country of origin of sandalwood. The following crops are considered economically productive for Timor-Leste: cashew nuts, mangos, spices, vanilla, pineapples, passion fruit, guavas, as well as flowers. The proposed drilling location is far offshore and would not have any significant impact on the agriculture and forestry aspects. The development of Oil and Gas subsequently would have a significant positive impact in the supply chain of fresh fruits and vegetable to Oil and Gas Industry.

11.6 Other Industries

Mineral and Energy Exploration

Timor-Leste is considered as a highly promising country for mineral and natural gas and oil both onshore and offshore. Based on the study carried out by UNESCAP, Timor-Leste has reserves of metallic minerals: copper-gold, chromite, gold, manganese; and also, non-metallic minerals: bentonite clay, phosphorite, gypsum and salt, wollastonite, graphite and talc, silica sands, sulphur, and ochre. In the northern edge of Timor-Leste, there are indications of the existence of copper, chromite, gold, silver, and manganese. The north edge of Oecusse is claimed as the richest copper zones in Timor-Leste as well as Baucau and north central Viqueque Municipality. Atauro and Ossu area of the Viqueque Municipality have number of gold and silver occurrences. In the eastern and western coastal areas of Timor-Leste possesses limestone and marl. Phosphate and bentonite are found in central Baucau Municipality. Good quality marble is also found in Manatuto. The belt from east Dili to the east coast possibly contains clay and kaolin. Mineral that has not been explored yet but are predicted to exist in Timor-Leste are laterite nickel, platinum, and diamonds. This is onshore and development of mining resources would boost the economic development of Timor-Leste.

11.6.1 Potential Impacts of Oil and Gas Exploration

The oil and gas sector is central to Timor-Leste's economy, historically contributing over 90% of government revenues. While its employment generation capacity is limited compared to its revenue contributions, it offers several specific benefits to the employment sector:

1. Creation of Direct and Indirect Jobs:

- Direct Employment: The sector requires specialized roles during appraisal drilling, and production phases, such as petroleum engineers, geologists, drilling engineers, and safety officers. These positions, though limited in number, are high-paying and skills-intensive.
- Indirect Employment: Support industries such as transportation, catering, equipment supply, and facility maintenance see increased demand. For instance, during the Bayu Undan gas project, local suppliers were contracted for logistics and site preparation services.

- Construction Opportunities: Infrastructure development for pipelines, refineries, and export facilities generates substantial short-term employment, often engaging unskilled and semi-skilled workers from local communities.

2. Skills Development and Knowledge Transfer:

- Technical Training Programs: Partnerships between oil and gas companies and local vocational institutions can upskill the workforce. For example, training programs in welding, machinery operation, and environmental safety equip workers with industry-relevant expertise.
- Apprenticeships and Internships: Opportunities for on-the-job training allow workers to gain practical experience under expert supervision, facilitating knowledge transfer from international professionals to local employees.
- Long-Term Career Development: Skills acquired in oil and gas operations, such as project management, engineering, and environmental monitoring, can be applied across multiple industries, ensuring sustainable career progression.

3. Economic Multiplier Effect:

- Boost to Local Enterprises: Oil and gas projects often rely on local suppliers for goods and services, stimulating the growth of small and medium-sized enterprises (SMEs). For instance, catering companies, transport operators, and equipment rental businesses benefit from increased demand.
- Infrastructure Development: Revenues from the sector are channelled into public infrastructure projects such as roads, ports, and power plants, creating additional employment opportunities and enhancing economic connectivity.
- Increased Household Income: Wages earned in oil and gas jobs flow back into the local economy, driving consumption and supporting retail and service sectors.

4. Support for Local Content Policies:

- Mandatory Local Hiring: Policies requiring oil and gas companies to hire a minimum percentage of local workers ensure that the economic benefits of projects are distributed within the community.
- Capacity Building for Local Suppliers: Companies often invest in training local businesses to meet industry standards, enabling them to compete for contracts in the oil and gas supply chain.

5. Gender Inclusion Opportunities:

- Encouraging Women's Participation: The sector can create targeted programs to train and hire women in technical and leadership roles, addressing historical gender disparities.
- Flexible Roles: Support positions, such as administrative, environmental monitoring, and community liaison roles, offer opportunities for women to engage in the workforce.

6. Community Development through Revenue Allocation:

- Education and Health Investments: Revenues from oil and gas projects are often used to fund public services, indirectly creating employment in education, healthcare, and social infrastructure.
- Social Programs: Community development initiatives funded by oil and gas revenues, such as scholarships, housing, and entrepreneurship grants, foster long-term socio-economic benefits.

12. SUMMARY OF ENVIRONMENTAL MANAGEMENT PLAN (EMP)

12.1 Introduction

This document provides a clear and simple explanation of the Environmental Management Plan (EMP) for the Chuditch-2 offshore drilling project in Timor-Leste. The goal of this summary is to assist in understanding how the project will be carried out while ensuring environmental protection and worker safety. It explains the purpose of the project, the benefits, possible environmental impacts, and the steps taken to reduce harm.

The detailed EMP is in a separate document as per Annex 6 of the Ministerial Diploma No. 46/2017 Regulation on the Detailed Requirements for Environmental Management Plans (EMP). The EMP is a detailed plan that outlines how the SGBU and its contractors will comply with environmental laws and ensure that the drilling activities do not cause long-term damage to the marine environment. It provides guidelines on safety measures, waste disposal, emergency preparedness, and community engagement.

The primary objectives of the EMP are as follows:

- To provide the necessary framework to effectively mitigate against environmental impacts during the appraisal well construction activities;
- To provide the means to ascertain the effectiveness of environmental protection / conservation measures identified in the EIS study, which will form the basis for additional / modified provisions to meet the stipulated limits where these are expected; and
- To provide guidance for environmental management so that the work is carried out in accordance with legislative requirements and in meeting the overall environmental objectives of the Project.
- Ensures that drilling activities follow environmental laws.
- Reduces harm to marine life and natural habitats.
- Keeps workers and nearby communities safe.
- Establishes a plan for responding to emergencies such as oil spills.
- Helps monitor and report environmental impacts.

12.2 Impact, Proposed Management, and Mitigation Measures

Table 38-Summary of impact, proposed management, and mitigation measure for Chuditch-2 appraisal drilling

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
Planned Events			
MODU positioning and anchor deployment	Seabed Disruption	Disturb benthic communities, affecting marine biodiversity	• Determine the rig leg positioning point based on the finding from seabed survey conducted before rig positioning. • Conduct seabed sediment and geotechnical sampling and pre-loading test to determine seabed stability during jack-up rig positioning to limit seabed destruction. • Jack-up rig positioning/deployment to be carried out according to standard procedures to minimise disturbance to the seabed sediments
Discharge of drilling mud, cuttings, and cement	Sediment Smothering	Burial and contamination of marine sediments, impacting benthic organisms	• Water-based mud (WBM) drill cuttings will be discharged following dispersion modelling and compliance with regulatory limits to minimize marine pollution. • Onboard separation of drilling muds for reuse as much as practicable to minimise drilling fluids discharge to the marine water. • Execute oil spill response plan to minimise spillage into marine water. • Installation of safety features such as automatic shutdown valves on the oily water separator to minimise risk of oily discharge to marine water. • Filter fine cuttings from the drilling muds by shale shaker aboard the rig/ jack-up rig. • Use of high efficiency triple deck shale shakers to reduce the need for fluid change out and minimizing the amount of residual fluid on drilled cuttings. • Cuttings to be treated in shale shaker to 9.2% SBM by average wet weight prior to discharge. • Discharge of cutting via a cutting caisson. • Testing of WBM drilling fluids physical properties prior to final discharge to sea

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
Chemical and Hydrocarbon Discharges	Water quality degradation	Increased turbidity and potential toxicity to marine life	• A copy of Material Safety Data Sheet (MSDS) should be made available and readily accessible on jack-up rig as guidance for material handling and disposal. • A designated and proper storage area for chemical and hazardous materials must be provided on derrick. The storage area should be sheltered and bunded to prevent rainwater collection and to contain spills. • Use less hazardous alternative chemicals, whenever possible. • Handling of chemicals and hydrocarbons should comply with strict procedures, including transfer and disposal procedures. • Retain records of chemical inventories. • Any spills and leaks of chemicals or hydrocarbon to deck should be cleaned immediately using absorbent materials. • All chemicals and hazardous wastes such as cleaning detergent, acids, solvents, toxic and medical wastes, contaminated mud, should be segregated and stored in clearly marked containers prior to disposal onshore.
Wastewater and Sewage Disposal	Water quality degradation	Temporary nutrient enrichment, attracting marine fauna to the drilling site	• Appropriate screens should be fitted to the seawater intake to prevent ingestion of marine life, if safe and practical. • Drainage water collected from precipitation, sea spray or routine operations such as deck and equipment cleaning and fire drills, should be routed to a deck drainage system on the jack-up rig for direct discharge. (Figure 8) • Contaminated water should be collected in preload tank for treatment using oily water separators as per MARPOL requirements. • Water collected from the drill floor should be channelled

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
			into pre-load tank for treatment using the oily water separator before discharge into the sea. IMO standard is 15ppm. Reg 16(5) refers. MARPOL requires water discharged overboard after treatment by an oil/water separator to be <15ppm. (Table 39) • Contaminated water from the hazardous material storage area should be channelled to pre-load tank for treatment using oily water separator before discharge into sea. • Spill kits, absorbents and containers to be made available for clean-up of oil and grease contamination on deck • The oil concentration in water discharge from the deck drainage should not exceed 15mg/L at any one time or on an average of 15mg/L over 24-hour period. (Table 39) • Bilge waters from machinery spaces on the jack-up rig should be routed to a separate drainage system on the deck, leading to the holding tank, contained and treated by oily water separator before discharge into the sea. The discharge should comply with the guidelines of oil concentration should not exceed 15mg/L. (Table 39) • Black water onboard should be channelled to the sewage treatment plant before discharge to sea.
MODU operations, well cleanup flaring, and fuel combustion	Air Pollution: Greenhouse Gas Emissions	Increase the cumulative impact on air quality and climate change	Consider safety issues on handling of volatile hydrocarbons during the recovery of test fluids which will be flared onsite.
Fossil Fuel Combustion from Power Generation	Air Pollution: Greenhouse Gas Emissions	Increase the cumulative impact on air quality and climate change	• Turning off engines when the machinery is not in use. • Periodical maintenance of machinery and equipment to ensure its efficiency. • Emission from fuel combustion machineries should be routed and emitted via adequate centralized exhaust system.

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
Fugitive Emission	Air Pollution: Greenhouse Gas Emissions	Increase the cumulative impact on air quality and climate change	• Selection of valves, flanges, fittings, seals, and filters should consider safety and suitability requirements as well as their capacity to reduce gas leaks and fugitive emissions. • Implement leak detection and repair programs. • Provision of adequate ventilation system in machinery and material storage room. • Good operational control and maintain high level of housekeeping.
MODU Operations	Noise and Light pollution		Minimise unnecessary lights directed towards water and minimise the duration of appraisal drilling.
MODU Operations, Food, Solid, Laboratory waste (if any),	Waste Pollution	Pollute marine habitats, affecting fisheries, and harming marine mammals, reptiles, and seabirds	• Food waste onboard should be treated using macerator with the final disposal having grain size of less than 25mm diameter prior to disposal into the sea. • Disposal of food and sewage into the sea should be handled in accordance to the MARPOL requirements. • No plastic or plastic products of any kind should be disposed overboard. • No domestic wastes i.e. cans, glass, paper or other wastes are to be discharged overboard. • No maintenance wastes i.e. paint sweepings, rags, deck sweeping, oil soaks, machinery deposits, etc, to be disposed of overboard. • Wastes should be segregated according to comparable characteristics, stored in clearly marked skips for treatment and disposal onshore at approved disposal sites in Darwin Australia. • Efforts should be made to eliminate, reduce or recycle

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
			wastes at all times. • Good housekeeping practices should be maintained on the deck. • Waste containers should be properly covered to prevent loss overboard. • A record should be maintained for solid wastes to be disposed of onshore. • Oil soluble chemicals should be disposed of to the jack-up rig holding tank to be treated in oily water separator prior discharge into sea.
Shipping activities	Social Disturbance	Interference with shipping activities	• Inform and consult the relevant authorities on the shipping routes and schedules of the jack-up rig and the location of drilling sites. • Maintain on going communication with other mariners on the presence and progress of the drilling activity. Employ radio system for real-time communication. • The rig should be lit during nighttime and during poor visibility.
		Shipment disturbance in Timor Sea EEZ	Notify appropriate maritime authorities of the drilling works prior to work commencement onsite
Physical presence			• Consult and notify the Fisheries Department via ANP and other vessel operators on the proposed appraisal drilling program. • Use findings from the seabed survey and sonar survey to assist in the positioning of the rig. • Ongoing communications with ANP throughout operations to prevent conflicts.
Plug and Abandonment			• Follow established plug and abandonment procedures for suspending/ abandoning well. • Conduct briefing (toolbox meeting) to all personnel

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
			involved for the plug and abandonment operation prior to work commencement
Unplanned Events			
Well Blowouts and Oil Spills	Oil Spills	Contaminating marine habitats, affecting fisheries, and harming marine mammals, reptiles, and seabirds	• Installation of Blow Out Preventer (BOP) system that can be closed rapidly in the event of an uncontrolled influx of formation fluids or completion fluids and which allows the well to be circulated safely by venting the gas at surface. • Periodical test and maintenance on the BOP during the operations. • Continuous monitoring of pressure reading during drilling to detect any abnormal pressures. • Maintaining well bore's pressure by effectively estimating formation fluid pressures and strength of subsurface formations. • Provision of emergency control plan and oil spill contingency plan and provision of emergency response training for the Drilling Crews.
Leak from fittings and connections or leak from engines or machineries		Contaminating marine habitats, affecting fisheries, and harming marine mammals, reptiles, and seabirds	• Install pressure low switch on flow lines. • Placing of drip trays and sump under engines to contain leaks. • Oil collected in the drip trays and sump to be periodically transferred to the containment tank. • Provide adequate ventilation at machinery room. Installation of gas detection device in the event of detection of dangerous gas levels.
Spillage during refueling		Contaminating marine habitats, affecting fisheries, and harming	• Schedule refueling activities during daylight hours and during calm weather and suitable sea-state conditions. • Refuelling only to occur at the discretion of the Vessel

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
		marine mammals, reptiles, and seabirds	Master and OIM. • Conduct hose and couplings checked for integrity prior to refuelling. • Dry break couplings to be used. • Continuous visual monitoring of hoses, couplings and sea surface during refueling to monitor potential spill and leakage and continuous monitoring of fuel flow gauges on the jack-up rig.
Vessel Collisions and Fuel Spills	diesel and synthetic-based mud (SBM) spills	Oiling of marine life and coral reefs.	• Monitor and communicate with vessels approaching drilling site to reduce the risk of vessel collision. • Navigation lighting and watch aboard the rig. • Provision of radio contact between jack-up rig and supply vessel at all times. • Distance support vessel's crane arm from jack-up rig during offloading and unloading. • Maintain update weather forecast information at jack-up rig.
MODU ballast water and biofouling on vessel hulls	Introduction of invasive species	introduce non-native marine species, potentially displacing indigenous marine biodiversity	Clearing of biofouling on rig legs, if necessary, prior rig mobilisation to and demobilisation from PSC TL-SO-19-16.
Overall Spills		Contaminating marine habitats, affecting fisheries, and harming marine mammals, reptiles, and seabirds	• Prepare Oil Spill Contingency Plan (OSCP). • Provision of Tier 1 spill kit on Supply vessels. • Spill clean-up kits on jack-up rig. • Design of drilling systems (i.e. well equipment, etc.) to reduce the risk of major un-contained spills. • Install valves to allow early shutdown or isolation in the event of emergency.

Program/Activity	Impact	Key Risk	Proposed Management & Key Mitigation Measures
			• Provide adequate personnel training in oil spill prevention, containment and response. • Ensure spill response contract for Tier 2 & Tier 3 response is in place and response equipment and personnel are available as necessary for response. • Conduct periodical inspection on chemical materials, hazardous wastes and oil storage area. • Stocks of absorbent materials on board/ jack-up rig and standby vessel to be periodically checked for their adequacy and replenished as necessary prior to the commencement of appraisal drilling activities. • ANP shall be informed of any oil spill incidents

The general governing parameters accepted as International Guidelines and Practice and in the offshore oil and gas development projects are given in Table 39.

Table 39-Effluent Discharge Quality on Oil and Gas Offshore Development

Parameter	Guidelines
Cooling water	**World Bank EHS Guidelines for Offshore Oil and Gas Development** • The effluent should result in temperature increase of no more than 30°C at edge of the zone where initial mixing and dilution take place/ where the zone is not defined, use 100m from point of discharge.
Sewage discharge within Timor Sea EEZ or in international water	**Protection of Sea (Prevention of Pollution from Ships) Act 1983 (MARPOL)** (Part IIIB, Division 2, Section 26D – Prohibition of discharge of sewage into the sea) • Sewage from the jack-up rig and supporting vessel should be treated either by sewage disinfection system or a sewage holding tank; • Discharge of the sewage are prohibited except the sewage has been treated using an approved system at a distance of more than 3nm from the nearest land; • Discharge of untreated or disinfected sewage only permitted at a distance of more than 12nm from the nearest land; • Where the sewage has been stored in holding tanks, the sewage is not discharged instantaneously but is discharged at a prescribed rate when the ship is proceeding en route at a speed of not less than 4knots; • The effluent does not produce visible floating solids in the waters of the sea and does not cause discolouration of the waters of the sea; and • No sewage (untreated or treated) to be discharged within 3nm from the nearest land.
Solid domestic and food wastes discharge within Timor Sea EEZ or in international water	**Protection of Sea (Prevention of Pollution from Ships) Act 1983 (MARPOL)** (Part IIIC – Section 26F- Prohibition of disposal of garbage into the sea) • No onboard disposal of plastic waste is allowed (In this section plastics includes synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products that may contain toxic or heavy metal residues); and • For onboard disposal of the garbage, the garbage has to be passed through a macerator so that it is capable of passing through a screen with no opening wider than 25mm; and the disposal occurs when the ship is as far as practicable from and is at a distance of not less than 12nm from, the nearest land or ice shelf.

Parameter	Guidelines
Ballast water	**Australian Ballast Water Management Guidelines** • In accordance with Timor-Leste regulations • In accordance with Australian Ballast Water Management Guidelines and Australian Quarantine and Inspection Services (AQIS) Regulations; and • The discharge of high-risk ballast water in Australian ports or waters is prohibited
Bilge water	**Protection of Sea (Prevention of Pollution from Ships) Act 1983 (MARPOL)** (Part II, Section 9 – Prohibition of discharge of oil or oily mixtures into sea) • Oil and grease concentration of the oily effluent discharge from ships should be below 15ppm.
Deck Drainage (non- hazardous and hazardous drains)	**Protection of Sea (Prevention of Pollution from Ships) Act 1983 (MARPOL)** (Part II, Section 10 – Prohibition of discharge of oil residues into sea) • Oil and grease concentration of the oily effluent discharge from ships should be below 15ppm.
Note: In the absence of international accepted regulations for discharge from jack-up rig, discharge limits/guidelines as stipulated in MARPOL have been adopted for screening criteria for this Project.	

All Health, Safety, and Environment (HSE) related aspects are responsible by SGBU and its drilling contractor management within the drilling of Chudicth-2 Appraisal Well.

12.3 Environmental Monitoring Reporting

Environmental Management Practices Monitoring will be integrated into the practices and procedures of HSE management system for implementation throughout the appraisal drilling program. This system applies to the drilling procedures and the operation of jack-up rig. The proposed environmental management practices monitoring covers the following aspects and are described in Table 40.

Table 40-Proposed Environmental Management Practice Monitoring

Particulars	Inspection[1]	Records[2]
Drilling mud	Daily operational log inspection based on daily drilling report.	Total volume intake to jack-up rig for each month. Total volume unused/ in storage on board at the end of each month. Total volume used and/or discharged into sea each month.
Fuel consumption	Daily operational log inspection based on daily report by Barge supervisor	Total volume intake to jack-up rig for each month. Total volume unused/ in storage on board at the end of each month. Total volume consumed for each month.
Chemicals and hazardous materials	Daily operational inspection of the storage area, management and transfer procedures and recorded in the daily mud report. Inspection to be carried out by the mud engineer as part of the daily operation procedures.	Total volume intake to jack-up rig for each month. Total volume unused/ in storage at the end of each month. Total volume consumed each month.
Sewage (black and greywater)	Weekly inspection for the sewage treatment facility	Total volume of pot water intake to jack-up rig for each month.
Food waste	Daily best management practices. Daily refuse log maintenance.	Volume of food waste generated and discharged into the sea for each month.
Garbage (plastic, glass, paper, etc)	Daily best management practise. Daily refuse log maintenance	Total volume of garbage generated and collected each month. Total volume of garbage transferred out for onshore disposal for each month.

Particulars	Inspection[1]	Records[2]
		Total volume of garbage storage on jack-up rig at the end of each month.
Hazardous waste (used paint, contaminated wastes, used chemical, etc.)	Maintenance of hazardous waste log by the storekeeper Weekly inspection of storage area by storekeeper	Total volume of hazardous wastes generated for each month. Total volume of hazardous wastes transferred for onshore disposal for each month. Total volume of hazardous wastes storage on jack-up rig at the end of each month.

Notes:
1 – The inspection scheduled is proposed for internal implementation by SGBU HSE on jack-up rig.
2 – The total volume to be summarized at the end of each month. This summary will be provided to ANP upon completion of each drilling cycle.

The outcomes from the EBS will set the data against which environmental monitoring during the drilling phase will be monitored and compared. The samples collected during monitoring will be analysed by a NATA accredited laboratory.

12.4 Conclusion

The Chuditch-2 drilling project is expected to lead to a gas field development project that will contribute significantly to Timor-Leste's economic growth while ensuring environmental safety. By following strict environmental laws, using advanced technology, and having a clear emergency response plan, the project aims to minimize negative effects on the environment.

The Environmental Management Plan ensures that drilling activities are carried out responsibly and provide environmental guidance so that the appraisal drilling program is conducted in line with the environmental requirements and minimizes the impact to the environment. It also identifies the roles and responsibilities of personnel and parties involved in the management of environmental aspects related to the appraisal drilling activities. Through cooperation with local authorities and community engagement, the project can support sustainable energy exploration while protecting Timor-Leste's marine ecosystems for future generations.

13. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

The public consultation for a Category A project, such as Chuditch-2 Appraisal Drilling is a requirement per Decree Law No. 39/2022 first amendment of Decree Law No. 5/2011 of Environmental License, for environmental assessment involving the preparation of the Environmental Impact Statement (EIS) and Environmental Management Plan (EMP). This requirement is aimed at addressing the public's concern, understanding, and acceptance of the project, especially on how the project may affect them positively and/or negatively.

13.1 Purpose of the Consultation

Public Consultation process for the Environmental Impact Assessment (EIA) is carried out in accordance with the Ministerial Diploma No. 47/2017 for the Regulation on the Public Consultation Procedures and Requirements during the environmental assessment process. Based on the aforementioned Ministerial Diploma, the objective of the public consultation is to disseminate information on the result of Environmental Baseline Survey (EBS) as part of EIA and Environmental Management Plan.

13.2 Methodology & Approach

The methodology and approach for this public consultation:

13.2.1 Methodology

- Preparation includes date and venues, invitation, coordination, and presentation materials.
- Identification of Stakeholders:
    1. *Autoridade Nacional do Petroleo* (ANP);
    2. Ministry of Petroleum and Mineral Resources (MPRM);
    3. Ministry of Tourism and Environment;
    4. *Unidade de Policia Maritima* (UPF-PNTL);
    5. *Unidade Policia Esplosivo;*
    6. *Autoridade Maritima Nacional;*
    7. *Direcção Nacional de Transporte and Maritima;*
    8. *Gabinete das Fronteiras Tereste e Maritima;*
    9. *Asosiasaun Peskas no Marina Timor-Lorosa'e* (APM-TL);
    10. Port Custom (Ministry of Finance);
    11. Port Authority (APORTIL);
    12. Ministry of Agriculture and Fisheries;
    13. *Forca Componente Marinha/Naval de Falintil Forca da Defesa de Timor-Leste (F-FDTL)*
    14. Ministry of Health;

15. Australian Embassy;
16. Civil Society Organizations – CSOs (e.g. Lao Hamutuk)
17. Ministry of Foreign Affairs;
18. Quarantine;
19. Direção Nacional da Protecção Civil – Bombeiros TL;
20. Direção Nacional de Meteorologia e Geofísica;
21. Autoridade Municipal de Dili;
22. SANTOS;
23. Eni Timor-Leste S.PA; and
24. UNTL – Faculdade Educação – Departamento Biologia.

13.2.2 Approach

- Public Notice will be published through ANP's website, proponent's website, any social networks such as Facebook, LinkedIn, Newspaper, Radio, and Televisions on the day of the EIS and EMP drafts submission.
- Through Public Notice: anyone has the right to review and provide their comments through writing via e-mail or in-person at the office of the Environmental Authority - ANP, Project Proponent – SGBU.
- SGBU will organize a formal meeting where result from the Environmental Baseline Survey (EBS) results, EIA, and potential impacts as well as mitigation measures will be presented to stakeholders identified in section 13.2.1 of this chapter.
- As a courtesy, SGBU will notify the Australian National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), the Northern Territory government, and the Australian Maritime Safety Authority (AMSA) of the offshore drilling.

13.3 Summary of Consultation

- Date : 22 April 2025
- Venue : Suai Room Timor-Plaza
  Rua Presidente Nicolao Lobato, Comoro, Dom Aleixo, Dili
- Time : 08.30 am to Finish
- Participants Registry: (Appendix 6)

13.4 Summary of Main Comments

The objective of this public consultation is to ensure transparency and responsibility in oil and gas exploration. Through this public consultation, everyone has the right to review and submit their concerns, if any, regarding the appraisal drilling campaign in Chuditch-2.

A few comments arose during the public consultation:

- Disturbance of marine life biodiversity from underwater noise pollution cause by drilling activity;
- Publicity of EBS results;
- Collaboration with UPM, UPF, and National Naval authority if any illegal activity is observed during drilling campaign;
- Economical viability of Chuditch field and contingency plan during the drilling campaign;
- Contribution of the drilling activity to the climate change in regard to the fishing activity;
- Challenges faced by SGBU in the delay of drilling activity;
- Technical preparation for ensuring safety and integrity during the campaign; and
- Marine environmental study.

13.5 Summary of Public Acceptance of the Project

During the Public Consultation and public notice, there was no opposition stated to the Chuditch-2 drilling campaign. On the contrary, there was broad acceptance of this campaign by the public, judging by the number of attendees and their proactive participation during the consultation event.

13.6 Photos for Public Consultation

Figure 43-Photos taken during Public Consultation for Draft EIS and EMP.

13.7 Recommendations for Future Consultations

SGBU will continue to collaborate with ANP and stakeholders to share any changes on any amendments on potential environmental impacts and any mitigation measures within EIS and EMP.

14. DIFFICULTIES ENCOUNTERED

Some of the challenges encountered during the assessment included limited access to historical climate data and the uncertain nature of future climate events. Understanding the regulatory requirements during the preparation of the Terms of Reference, the necessity of environmental baseline studies for such a short duration (44 days) single well drilling project was challenging. Validation of the oil spill modelling and drill cutting dispersion modelling involved many discussions to obtain clarity of the scope of work, modelling parameters and modelling output and report. SGBU working in Timor-Leste and preparing for the drilling project constrained in understanding the local infrastructure and legislative requirement to conduct an early EBS which caused delay in preparing this EIS. The public consultation process defined by ANP and discussing with stakeholders was another area that required added focus.

15. CONCLUSION AND RECOMMENDATIONS

The Environmental Impact Statement (EIS) evaluates the potential risks arising from the proposed appraisal drilling program and outlines mitigation measures to address environmental, social, and economic impacts. Generally, the assessment has been conducted based on the drilling operational program and drilling method. The EIS is prepared in accordance with the Terms of Reference submitted by SGBU and approved by ANP.

The existing environment of the Project site has been assessed mainly based on combination of secondary data and primary data for marine water quality, ambient air, seabed sediment and marine microbiological data from the field sampling conducted in February 2025. Other areas of interest in respect to the proposed activities in the offshore environment include marine ecology, meteorological conditions, oceanography, bathymetry, fisheries and shipping activities.

Environmental impacts associated with the proposed appraisal Chudtich-2 drilling project were assessed and the magnitude of impacts against the existing environment were discussed in Chapter 9. The impact assessed to be of high importance/inherent risk is the uncontrolled release of formation fluids from the well (gas and associated condensate). The medium importance inherent risks were atmospheric emissions (SOx/NOx and greenhouse gases), discharge of drill cuttings and drilling fluids, solid and hazardous waste, sewage, domestic wastewater wastes and social, economic and cultural. The low impact inherent risks identified are oil, fuel and chemical spills, deck drainage, laboratory waste, cooling water, desalination brine, antifouling biocides, ballast water and marine pest, physical disturbance to marine biota, noise and artificial lighting.

Modelling studies indicate that discharged drill cuttings settle within a 200m radius, with Total Suspended Solids (TSS) concentrations dropping to background levels (≤25 ppm) within 50m. The Oil spill scenarios (including well blowouts and transfer hose failures) predict rapid evaporation (e.g., diesel and condensate evaporating ~75% within five days), weathering and dispersion, with no shoreline risk predicted.

The conclusion and recommendation of this EIS are that for the high and medium risk impacts, the proponent is to integrate the proposed environmental mitigation measures as in Chapter 9 into the drilling operation procedures, particularly to:

- Conduct engine and compressor maintenance per manufacturers specifications to improve fuel combustion efficiency.
- Implement strict operational procedures, including optimized fuel injection systems and high-efficiency flare burner designs during testing to minimize fugitive emissions.
- Use of high-efficiency shale shakers and centrifuges to minimize discharge of drill cuttings and residual SBM fluids.
- For drilling cuttings discharges, employing cuttings caissons and ensuring discharge below the sea surface to aid in enhancing dispersion and reducing sediment deposition impacts.
- Proper segregation and disposal of all waste materials by type (non-hazardous, hazardous, maintenance) and managed through onshore transfer for recycling or disposal.
- Develop a well control plan, a robust emergency management plan including uncontrolled release gas / condensate, an Oil Spill Contingency Plan (OSCP) to ensure prompt response, including pre-tested safety features (e.g., Blowout Preventers, pressure testing, and Emergency Shutdown valves).
- Personnel are trained in waste-handling protocols, and regular record-keeping ensures compliance.
- Scheduling operations outside key migratory or breeding periods (e.g., avoiding peak sea turtle nesting seasons) minimizes ecological disturbance.
- Direct artificial lighting over work areas and minimizing unnecessary light spill to reduce the risk of disorientation among marine fauna.
- Where practical, actively source and train workers from Timor-Leste and contribute to regional capacity building.
- Communicate and plan stakeholder consultations to address any public concerns.

- Conduct inspections, audits and carry out environmental management monitoring programs which are important to keep track of the environmental performance of the drilling activities.

The mitigation measures proposed for all the impacts identified are aimed at protecting the physical, biological, and socio-economic environments. An Environmental Management Plan (EMP) has been developed to manage the potential impacts of the proposed activities and ensure that they remain at acceptable levels throughout the course of the program. With the nature of the proposed appraisal drilling project, which is of short duration (44 days) with no permanent structures, the impacts are considered temporary and localised.

In conclusion, through implementation of mitigation measures and environmental management monitoring, all the identified inherent risks are reduced to ALARP. The Chuditch-2 Appraisal drilling well project may proceed with appropriate mitigation and monitoring in place.

16. NON-TECHNICAL SUMMARY

Non-Technical Summary	**Sumariu Naun-Tekniku**
Introduction	**Introdusaun**
SundaGas Banda Unipessoal, Lda (SGBU) and TIMOR GAP Chuditch Unipessoal, Lda (TIMOR GAP) were awarded a Production Sharing Contract (PSC) in 2019 to explore petroleum resources in Timor-Leste's offshore waters. The Chuditch field spans approximately 3,571 km² in the Timor Sea, located about 185 km south of Timor-Leste. This offshore region has significant potential for natural gas extraction, which could contribute to the country's energy sector and economic development.	SundaGas Banda Unipessoal, Lda (SGBU) no TIMOR GAP Chuditch Unipessoal, Lda (TIMOR GAP) hetan Kontratu Fahe Produsaun *(Production Sharing Contract – PSC)* iha 2019 atu esplora rekursu petrolíferu iha Tasi Timor. Kampu Chuditch nia luan maizumenus 3,571 km² iha Tasi Timor, lokaliza maizumenus 185 km husi parte súl Timor-Leste nian. Parte tasi Timor ida ne'e iha potensiál signifikante ba estrasaun gás naturál, ne'ebé bele kontribui ba setór enerjia no dezenvolvimentu ekonómiku nasaun nian.
To assess the presence of hydrocarbons, SGBU plans to drill an appraisal well, Chuditch-2, in 68 meters of water using a jack-up rig. The well is expected to reach 3,010m in depth to analyze gas reserves and confirm commercial viability.	SGBU planeia atu fura posu avaliasaun ida Chuditch-2 ho tasi nia kle'an metru 68 uza *jack-up rig*, hodi avalia prezensa hidrokarnonetu iha kampu refere. Perfurasaun ida ne'e sei too profundidade metru rihun tolu sanulu hodi analiza reserva gás no konfirma viabilidade komersiál iha area kontratu refere.
Given its potential environmental impact, the project has been classified as Category A, requiring a full Environmental Impact Assessment (EIA) to formulate Environmental Impact Statement (EIS) and Environmental Management Plan (EMP) to ensure sustainable and responsible appraisal drilling activities.	Bazeia ba impaktu ambientál, projetu ne'e klasifika ona hanesan Kategoria A, ne'ebé presiza Avaliasaun Impaktu Ambientál (AIA) kompletu ida hodi formula Deklarasaun Impaktu Ambientál (DIA) no Planu Jestaun Ambientál (PJA) hodi asegura atividade esplorasaun ne'ebé sustentável no responsável.
The drilling campaign is scheduled for Q3 2025 with the Rig mobilization, drilling and well testing anticipated to last around 44 days. SGBU will obtain all regulatory approvals and have mitigation strategies in place before execution. The successful completion of this well will provide critical data for the future development of Timor-Leste's natural gas resources.	Kampaña perfurasaun sei hala'o iha Q3 2025 ho mobilizasaun Rig, perfurasaun no teste posu nian ne'ebé antisipa sei dura loron 44. SGBU sei hetan aprovasaun regulatóriu sira no prepara ona estratéjia mitigasaun nian molok ezekusaun. Bainhira perfurasaun ne'e susesu, nia rezultadu sei fornese dadus krítiku ba futuru dezenvolvimentu rekursu gás naturál iha Timor-Leste.
The project will include necessary infrastructure for drilling support, such as logistics centers and supply bases in Australia.	Projetu ne'e sei persiza infraestrutura
The Well Abandonment and Demobilization	

would be undertaken upon completing drilling, the well will be plugged and abandoned using cement slurries and a bridge plug. The rig will then be decommissioned and moved out of Timor-Leste waters.

Environmental Consideration

The EIA assesses potential risks, develops mitigation strategies, ensures compliance with environmental laws, and involves stakeholder engagement. It will guide the creation of an EMP and Environmental Monitoring Program.

An Environmental Baseline Survey (EBS) was conducted in February 2025 to evaluate seawater and sediment quality, marine biodiversity, and socio-economic impacts.

The EBS assessed the existing environmental conditions in the project area to establish a reference point for evaluating potential impacts. Marine water quality in the Timor Sea remains pristine, with high dissolved oxygen levels and minimal pollution. The area does not contain significant coral reefs, reducing concerns about direct habitat destruction. However, the presence of marine mammals and fish species necessitates protective measures to prevent disturbances.

Air quality impacts are expected to be minimal, as offshore drilling operations allow for the rapid dispersion of emissions. The project's remote offshore location also ensures that socio-economic activities such as fisheries and tourism will not face significant disruptions. Overall, the study confirms that while some environmental risks exist, they can be effectively managed through best industry practices and strict regulatory compliance.

Potential Environmental Impacts and Mitigation Measures

Discharges from drilling fluids, waste, or

nesesária ba apoiu perfurasaun, hanesan sentru lojístika no baze fornesimentu iha Austrália.

Posu refere sei taka no abandona uza simentu nia maran, hafoin, *rig* ne'e sei dekomisaun no muda sai husi tasi Timor.

Konsiderasaun Ambientál

AIA avalia risku sira, dezenvolve estratéjia mitigasaun nian, asegura kumprimentu ho lei ambientál sira, no inklui envolvimentu hosi parte interesada sira *(stakeholders)*. Ida-ne'e sei sai guia ba kriasaun PJA no Programa Monitorizasaun Ambientál.

Levantamentu Baze Ambientál (EBS) ne'ebe hala'o iha Fevereiru 2025, avalia kualidade tasi-been no sedimentu, biodiversidade tasi nian iha area besik ba kampu Chuditch-2, no impaktu sosio-ekonómiku sira.

EBS avalia kondisaun ambientál sira ne'ebé eziste iha área projetu nian hodi estabelese pontu referénsia no avalia impaktu potensiál. Kualidade bee tasi nian iha Tasi Timor moos, ho nível oksijéniu dissolvidu aas no poluisaun mínimu. Área ne'e la kontein ahu-ruin ne'ebé signifikativu, nune'e laiha destruisaun direta ba habitat. Maibé, prezensa hosi mamíferu tasi nian no espésie ikan sira presija medida protesaun hodi prevene perturbasaun.

Tuir ekspektasaun, impaktu ba kualidade ar nian sei mínimu, tanba atividade perfurasaun ne'e iha tasi-klaran no emisaun hirak ne'ebe akontese bele dispersa ka lakon lalais. Lokalizasaun projetu ne'ebe remota iha tasi-klaran mós garante katak atividade sosio-ekonómiku sira hanesan peskador sira no turizmu sei la hasoru interupsaun signifikativu. Jeralmente, estudu ne'e konfirma katak enkuantu risku ambientál balu eziste, impaktu sira ne'e bele jere ho efetivu liuhosi prátika indústria ne'ebé di'ak no kumprimentu regulatóriu ne'ebé rigorozu.

Impaktu Ambientál no Medida

accidental oil spills can pose risks to marine ecosystems. To mitigate these risks, the project will use low toxicity drilling fluids, implement advanced waste management systems to separate and treat drill cuttings, and establish oil spill response planning. These plans will provide a best practice response employing advice from global leaders in oil spill response and recovery, Oil Spill Response Limited (OSRL) the deployment of oil spill response equipment and deployment of emergency response teams to manage potential spills efficiently.

Air emissions from drilling and vessel operations will be controlled through the use of fuel-efficient engines and continuous emissions monitoring. The project also aims to minimize flaring activities during the testing, which can contribute to greenhouse gas emissions. Additionally, efforts will be made to reduce disturbances to marine life caused by noise and artificial lighting. Noise-reduction technologies and directional lighting will be employed to limit environmental disruption. Routine environmental monitoring will ensure that all emissions remain within regulatory limits and that mitigation measures are effectively implemented throughout the project duration.

The EIS highlights potential impacts such as air emissions, marine pollution, and ecological disturbance. Mitigation strategies include adopting low-emission engines, routine monitoring, and using water-based and synthetic-based muds.

Conclusion

The Chuditch-2 project represents a major step toward unlocking Timor-Leste's offshore energy potential. With strict environmental safeguards in place, the project aims to balance economic benefits with sustainable resource management. Through careful planning, regulatory compliance, and responsible operational

Metigasaun

Descarga hosi fluidu perfurasaun nian, lixu, ka derramamentu mina-rai husi asidenti bele hamosu risku ba ekosistema tasi nian. Atu hamenus risku sira-ne'e, projetu sei uza fluidu perfurasaun ho toxisidade ki'ik, implementa sistema jestaun lixu avansadu hodi haketak no trata fluidu perfurasaun *(drill cuttings)*, no estabelese planu hodi resposta ba derramamentu mina-rai. Planu sira-ne'e sei fornese resposta prátika ne'ebé di'ak liu no uza konsellu hosi líder globál sira ba resposta no rekuperasaun bainhira akontese derramamentu mina-rai, *Oil Spill Response Limited* (OSRL) kolokasaun ekipamentu resposta ba derramamentu mina-rai no kolokasaun ekipa resposta emerjénsia hodi hatan ba derramamentu ne'ebe karik akontese ho efisiente.

Emisaun ar husi perfurasaun no operasaun ró nian sei kontrola liuhosi utilizasaun motór ne'ebé efisiente iha kombustível no kontinua monitorizasaun ba emisaun hirak ne'e. Projetu ne'e iha intensaun atu minimiza ahi-lakan *(flaring)* durante teste, ne'ebé bele kontribui ba emisaun *greenhouse gas*.

Sei iha mós esforsu atu hamenus perturbasaun ba moris tasi nian ne'ebé hosi barullu no iluminasaun artifisiál. Teknolojia ba redusaun barullu no iluminasaun diresionál sei uza hodi limita disrupsaun ambientál. Monitorizasaun ambientál rutina sei garante katak emisaun hotu-hotu mantein tuir limite regulatóriu no medida mitigasaun sei implementa ho efetivu durante projetu.

DIA destaka impaktu potensiál hanesan emisaun ar, poluisaun tasi, no perturbasaun ekolojia. Estratéjia mitigasaun inklui uza motór sira ho emisaun ki'ik, monitorizasaun rutina, no uza fluidu perfurasaun ho baze bee *(Water-Based Mud)* no sintétiku *(Synthetic-Based Mud)*.

practices, the project seeks to ensure minimal environmental impact while contributing to Timor-Leste's long-term energy security and economic growth.	**Konklusaun** Projetu Chuditch-2 reprezenta pasu boot ida hodi loke Timor-Leste nia potensiál enerjétiku iha tasi-laran. Ho protesaun ambientál ne'ebé rigorozu, projetu ne'e sei halo balansu entre benefísiu ekonómiku ho jestaun rekursu ne'ebé sustentável. Liuhosi planeamentu rigurozu, kumprimentu regulatóriu, no prátika operasionál ne'ebé responsavel, projetu ne'e garante mínimu impaktu ambientál, enkuantu kontribui nafatin ba Timor-Leste nia seguransa enerjétika ba tempu naruk no kreximentu ekonómiku.

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APPENDIX 1: MARINE WATER QUALITY

The details results and analysis of the marine water quality are reproduced from the Chuditch-2 Environmental Baseline Survey (EBS) Technical Report dated March/April 2025 conducted by WA Marine Pty Ltd trading as O2 Marine, Western Australia. The data, figures, tables and information are reproduced from that report as primary information around the Chuditch-2 Appraisal Well Program.

Marine water quality profiles and data:

1. Physiochemical Profiles

Summary statistics calculated from physiochemical water column profiles are presented in Table A1-1 whilst water column profiles are displayed in Figure A1-1 in summary:

- pH results ranged from between 8.21 and 8.26
- Salinity results ranged between 34.05 and 34.19
- Temperature values ranged between 28.77 and 30.39
- Conductivity results ranged between 51990.00 and 52147.10
- Turbidity values ranged between 0.06 and 0.26

Table A1- 1-Median physiochemical profile results for profiles sampled on 29th of January 2025

Site	pH	Salinity	Temperature	Conductivity	DOsat	Turbidity
Units	-	PPT	°C	µs/cm	%	FNU
IMCRA (2018)	-	34.7	28.8 - 31.3	-		-
1	8.23	34.07	30.29	52025.30	94.80	0.07
2	8.21	34.16	29.27	52110.50	87.20	0.06
4	8.22	34.19	29.30	52147.10	89.70	0.06
7	8.22	34.19	29.18	52132.70	89.80	0.08
8	8.22	34.17	29.33	52115.30	91.10	0.08
9	8.21	34.19	28.97	52079.85	87.40	0.06
11	8.26	34.17	29.05	52111.40	87.90	0.22
12	8.24	34.18	28.90	52118.15	86.35	0.07
13	8.24	34.13	29.18	52067.70	88.90	0.07
14	8.22	34.18	28.84	52121.45	84.70	0.16
16	8.25	34.05	29.98	51990.00	94.30	0.26
17	8.21	34.19	28.77	52128.05	83.10	0.11
Median	8.22	34.18	29.18	52113.35	88.40	0.08
Max	8.26	34.19	30.29	52147.10	94.80	0.26
Min	8.21	34.05	28.77	51990.00	83.10	0.06
St-Dev	0.02	0.05	0.45	46.94	3.49	0.07

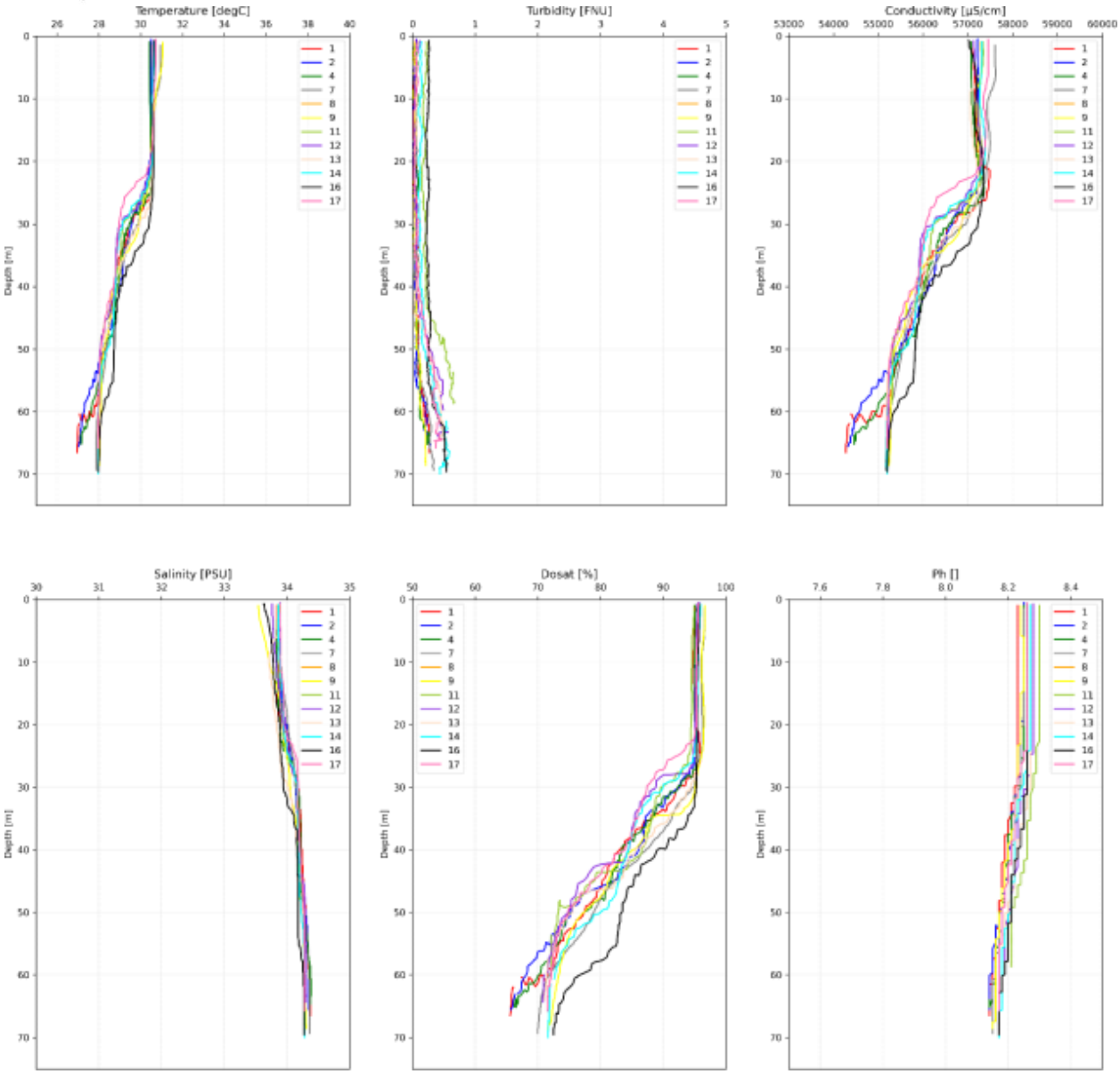


Figure A1 1-Physiochemical water quality profiles

2. PAR Profiles

Results from the light (PAR) from water column profiles are summarized in Table A1-2 and presented in Figure A1-2.

Table A1- 2-PAR summary results. Surface PAR results include values from the first meter of the profile an bottom PAR results include values from the last meter of the profile.

Site	Mean PAR	
	Surface	Bottom
1	92.79	0.57
2	225.99	1.76
4	127.58	1.14
7	899.13	2.98
8	1115.80	2.70
9	983.63	1.98
11	232.00	1.21
12	363.75	1.56
13	630.66	0.97
14	315.44	0.66
16	150.67	0.82
17	468.90	0.73
Mean	467.20	1.42
Max	1115.80	2.98
Min	92.79	0.57
StDev	357.21	0.80

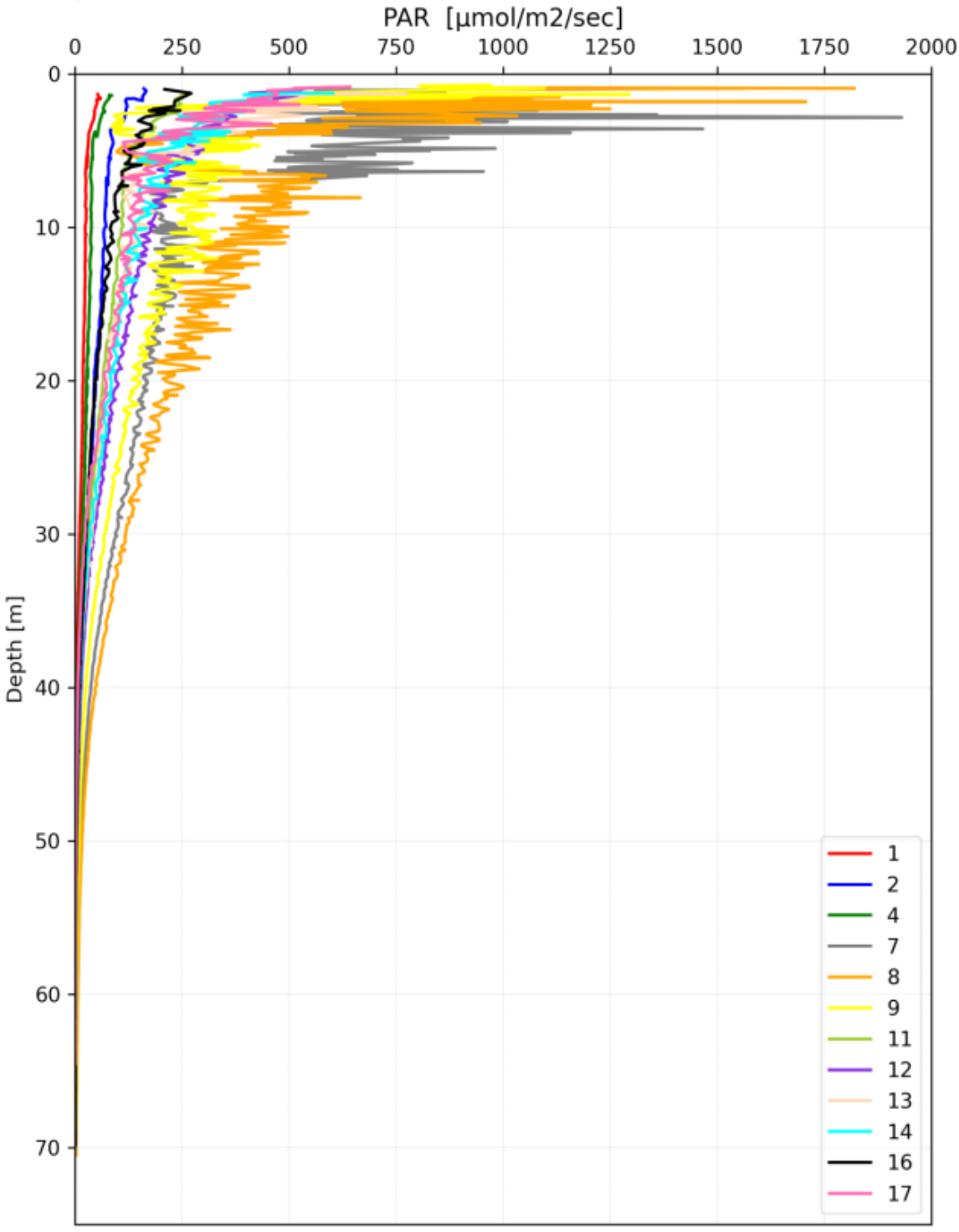


Figure A1 2-Water column PAR profile

3. Water Quality Profiling

Water quality profiling results collected across the project area display a very low level of spatial variability, with all sites displaying very similar concentrations and results. Temperature, salinity, turbidity and pH were observed to stable for surface to seafloor, with minimal variability evident at all sites. Conductivity generally decreased from around the 25m mark, which also corresponded with DO % decreases, and very minor decreases of pH.

Temperature profiles across all locations were relatively consistent, ranging from 28.77°C to 30.29°C, with surface water averaging 27.4°C. The presence of a very minor thermocline can be observed at around the 22- 25 m depth contributing to a gradual decline in temperature to the seafloor. The conductivity pH and DO% profiles closely mirrored the temperature patterns, with all presenting a decrease from approximately the same depth to the seafloor, observed quite apparently for DO % and conductivity.

Salinity values remained stable across all sampling areas, with a median value of 34.18 PPT and a range of only 0.14 PPT. The observed consistency in salinity suggests minimal freshwater intrusion or significant oceanographic mixing processes affecting the sampled locations. Similarly, pH values were stable, ranging from 8.21 to 8.26, with median of 8.22 across all sites.

Turbidity levels were generally very low with a maximum of 0.26 NTU, and a range of only 0.2 NTU. As expected, all profiles were slightly higher closer the profile end when compared to the surface. Despite these minor observations, turbidity levels indicate minimal sediment resuspension and low particulate matter concentrations as to be expected within the deeper open ocean waters.

DO levels across the surveyed areas were generally high with all surface to ~25 m DO % recording around 95 %. As described above, DO levels began to slowly decrease from around ~25 m, resulting in a maximum calculated range of 11.7%. This pattern suggests a stratified water column with oxygen consumption occurring below the thermocline. However, DO concentrations remained well above hypoxic thresholds, indicating a healthy and well-oxygenated marine environment

As is to be expected PAR results were highly variable at the surface and all reduced to very similar results at the seafloor, Surface results ranged from 92.79 to 1115.80, with an average of 467.20 ± 357.21, whilst seafloor PAR had an average of 1.42 ± 0.80. Variability was observed to be high for surface PAR; however, this was merely a function of sampling time and date with sites 7, 8 and 9 displaying far higher surface PAR than sites sampled early in the morning. Sites sample data similar time of day, but on a different date would have been impacted by cloud cover reducing photosynthetic light.

4. Dissolved Metals in water samples

Dissolved metals results are presented in Table A1-3, in summary:

- Gold, mercury, and manganese results were reported below the LOR in all samples.
- Remaining metals were all reported at low concentration below ANZG (2018) 95% and 99% SPLs, except which was slightly elevated at Site 2 surface sample and Zinc which was slightly elevated above the 99% SPL in mid-water samples at site 1 and 4.

SundaGas Banda
Unipessoal Lda

Halona Serena Lda

Table A1- 3-Dissolved metals results from water samples collected on the 27th and 28th of January 2025. Values that exceed 99% are highlighted blue.

Site	As	Ag	Ba	Cd	Co	Cu	Cr	Fe	Pb	Mn	Hg	Ni	Sb	Se	Zn
Units	mg/L														
95% SPL	-	-	-	0.002	0.001	0.0013	-	-	0.0044	-	0.0004	0.07	-	-	0.008
99% SPL	-	-	-	0.0007	0.001	0.0003	-	-	0.0022	-	0.0001	0.007	-	-	0.0033
1_S	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	0.0003	0.0004	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.002
1_M	0.0017	<0.1	0.02	0.0006	<0.00005	0.0003	0.0003	0.02	0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.004
1_B	0.0018	<0.1	< 0.01	< 0.0001	<0.00005	0.0003	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.001
2_S	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	0.0004	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.002
2_M	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	0.0003	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.002
2_B	0.0016	<0.1	0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	<0.001
4_S	0.0017	<0.1	0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.002
4_M	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.001	< 0.0001	< 0.001	< 0.001	< 0.001	0.004
4_B	0.0017	<0.1	0.01	< 0.0001	<0.00005	<0.0002	0.0004	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	<0.001
7_S	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.001
7_M	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.001
7_B	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.001
8_S	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.003
8_M	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.001
8_B	0.0018	<0.1	< 0.01	< 0.0001	<0.00005	0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	<0.001
9_S	0.0015	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.002
9_M	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	<0.0002	0.02	0.002	< 0.005	< 0.0001	0.001	0.001	0.001	0.002
9_B	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0004	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.001
11_S	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	0.0003	<0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.001
11_M	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.001
11_B	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	<0.001
12_S	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	<0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.002
12_M	0.0017	<0.1	0.01	< 0.0001	<0.00005	<0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.001
12_B	0.0017	<0.1	0.01	< 0.0001	<0.00005	0.0002	0.0007	0.02	< 0.001	< 0.005	< 0.0001	0.001	< 0.001	< 0.001	0.001
13_S	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.002
13_M	0.0016	<0.1	< 0.01	< 0.0001	<0.00005	0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.002
13_B	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	<0.001
14_S	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.001
14_M	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0004	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	<0.001
14_B	0.0017	<0.1	0.02	< 0.0001	0.00006	<0.0002	0.0004	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	<0.001
16_S	0.0016	<0.1	0.01	< 0.0001	<0.00005	0.0002	0.0004	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.002
16_M	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0003	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.001
16_B	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	<0.0002	0.0004	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	<0.001
17_S	0.0017	<0.1	< 0.01	< 0.0001	<0.00005	0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	0.001	0.001	0.002
17_M	0.0017	<0.1	0.01	< 0.0001	<0.00005	<0.0002	0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	0.002

Site	As	Ag	Ba	Cd	Co	Cu	Cr	Fe	Pb	Mn	Hg	Ni	Sb	Se	Zn
Units	mg/L														
17_B	0.0016	<0.1	0.01	< 0.0001	<0.00005	<0.0002	<0.0002	0.02	< 0.001	< 0.005	< 0.0001	< 0.001	< 0.001	< 0.001	<0.001
Median	0.00165	-	0.005	0.00005	0.000025	0.0001	0.0003	0.008	0.0005	-	-	0.0005	0.00075	0.00075	0.002
Max	0.0018	-	0.02	0.0006	0.00006	0.0004	0.0007	0.04	0.002	-	-	0.001	0.001	0.001	0.004
Min	0.0015	-	0.005	0.00005	0.000025	0.0001	0.0001	0.005	0.0005	-	-	0.0005	0.0005	0.0005	0.001
St-Dev	0.00007	-	0.004	0.00009	-	0.00008	0.00012	0.011	0.0003	-	-	0.0001	0.0003	0.0002	0.001

5. Hydrocarbons

Hydrocarbon results from water samples are presented in Table A1-4 (THR), Table A1-5 (BTEXN, VOCs), and Table A1-6 (TOC, TSS).

Table A1- 4-Total Recoverable Hydrocarbons (TRH) reported in all sample sites.

Site	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36 (Total)	C6-C10	C6-C10 less BTEX	>C10-C16	>C10-C16 less Naphthalene	>C16-C34	>C34-C40	>C10-C40 (Total)	Naphthalene
LOR	0.02	0.02	0.04	0.04	0.04	0.02	0.02	0.02	0.02	0.05	0.05	0.05	0.001
Unit	mg/L												
1_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
1_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
1_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
2_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
2_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
2_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
4_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
4_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
4_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
7_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
7_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
7_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001

Site	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36 (Total)	C6-C10	C6-C10 less BTEX	>C10-C16	>C10-C16 less Naphthalene	>C16-C34	>C34-C40	>C10-C40 (Total)	Naphthalene
LOR	0.02	0.02	0.04	0.04	0.04	0.02	0.02	0.02	0.02	0.05	0.05	0.05	0.001
Unit	mg/L												
8_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
8_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
8_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
9_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
9_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
9_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
11_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
11_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
11_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
12_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
12_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
12_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
13_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
13_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
13_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
14_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
14_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
14_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
16_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
16_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
16_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
17_S	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
17_M	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001
17_B	<0.02	<0.02	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.001

Table A1- 5-Volatile Organic Compounds (VOCs) reported in all sample sites were the same values.

Compound	LOR	Unit	Result
Benzene	0.5	ug/L	< 0.5
Carbon tetrachloride	0.5	ug/L	< 0.5
Chlorobenzene	0.5	ug/L	< 0.5
DCM	5	ug/L	< 5
Ethylbenzene	0.5	ug/L	< 0.5
Hexachlorobutadiene	0.5	ug/L	< 0.5
Methyl-tert-Butyl Ether	0.5	ug/L	< 0.5
Styrene	0.5	ug/L	< 0.5
Perchloroethene (PCE)	0.5	ug/L	< 0.5
Toluene	0.5	ug/L	< 0.5
Trichloroethylene(TCE)	0.5	ug/L	< 0.5
Vinyl Chloride	0.2	ug/L	< 0.2
Xylenes (Total)	3	ug/L	< 3
1.1-Dichloroethane	0.5	ug/L	< 0.5
1.2-Dichloroethane	0.5	ug/L	< 0.5
1.1-Dichloroethene	0.5	ug/L	< 0.5
cis-1.2-Dichloroethene	0.5	ug/L	< 0.5
trans-1.2-Dichloroethene	2	ug/L	< 2
1.1.1-Trichloroethane	0.5	ug/L	< 0.5
1.1.1.2-Tetrachloroethane	0.5	ug/L	< 0.5
1.1.2.2-Tetrachloroethane	0.5	ug/L	< 0.5
1.2-Dichlorobenzene	0.5	ug/L	< 0.5
1.3-Dichlorobenzene	0.5	ug/L	< 0.5
1.4-Dichlorobenzene	0.5	ug/L	< 0.5
1.2.3-Trichlorobenzene	0.5	ug/L	< 0.5
1.2.4-Trichlorobenzene	0.5	ug/L	< 0.5
1.3.5-Trichlorobenzene	0.5	ug/L	< 0.5

6. Chlorophyll-a

Chlorophyll-α results are presented in Table A1-6. Chlorophyll-α was reported below the LOR in all water quality samples.

7. Oil and Grease

Oil and Grease water sample results are presented in Table A1-6 and in Appendix E. In summary:

- Oil and Grease values ranged between <5mg/Land 9mg/L
- Median oil and grease results across all sampling sites was <5mg/L

8. Sulphur

Sulphur water quality results are presented in Table A1-6. In summary:

- Sulphur results ranged between 3.3 mg/L and 1300 mg/L
- Sulphur results reported at site 9 (3.3 mg/L) represented an outlier when compared against results obtained at other sampling locations.
- With the exception of the middle sample collected at site 9, sulphur results were generally consistent between sites and across depths.

Table A1- 6-Oil & Grease, Sulphur, Chlorophyll-a, TOC, and TSS (dried at 103-105°C) reported in all sample sites.

Site	Oil & Grease	Sulphur	Chlorophyll-a	TOC	TSS
LOR	5	0.1	0.001	5	5
Units	mg/L				
1_S	< 5	1100	<0.001	<5	18
1_M	< 5	1100	<0.001	<5	20
1_B	< 5	1100	<0.001	<5	12
2_S	< 5	1100	<0.001	<5	17
2_M	< 5	970	<0.001	<5	22
2_B	< 5	1100	<0.001	<5	19
4_S	< 5	1000	<0.001	<5	22
4_M	< 5	1100	<0.001	<5	18
4_B	< 5	1000	<0.001	<5	17
7_S	< 5	1100	<0.001	<5	20
7_M	< 5	1000	<0.001	<5	19
7_B	< 5	1100	<0.001	<5	20
8_S	< 5	1000	<0.001	<5	16
8_M	< 5	1000	<0.001	<5	18
8_B	< 5	1000	<0.001	<5	13
9_S	< 5	1000	<0.001	<5	14
9_M	< 5	3.3	<0.001	<5	22
9_B	< 5	980	<0.001	<5	9.0
11_S	< 5	930	<0.001	<5	16
11_M	< 5	990	<0.001	<5	28
11_B	< 5	960	<0.001	<5	17
12_S	9	970	<0.001	<5	12
12_M	8	970	<0.001	<5	18
12_B	9	1000	<0.001	<5	15
13_S	8	1200	<0.001	<5	15
13_M	5	1100	<0.001	<5	19
13_B	5	1200	<0.001	<5	18
14_S	5	1100	<0.001	<5	16
14_M	< 5	1100	<0.001	<5	11
14_B	< 5	1200	<0.001	<5	8.0
16_S	< 5	1300	<0.001	<5	6.0
16_M	< 5	1200	<0.001	<5	7.0
16_B	< 5	1200	<0.001	<5	<5
17_S	< 5	1200	<0.001	<5	15
17_M	5	1200	<0.001	<5	12
17_B	< 5	1200	<0.001	<5	20

Discussion and Conclusion on Marine Environmental Quality

Water Quality Samples

Water quality samples collected across the project area generally showed low dissolved metal concentrations, with most metals either below the Limit of Reporting (LOR) or ANZG (2018) 95% and 99% Species Protection Levels (SPLs). The only exception was copper (one exceedance) and zinc (two exceedances). Limited water quality data exist for the project area, with the nearest comparable marine water sampling conducted at the Barossa gas fields, approximately 450 km away (Jacobs 2015). Baseline surveys at Barossa reported similarly low dissolved metal concentrations (Jacobs 2016a). Despite the three minor exceedances of the 99% SPL, copper and zinc levels at the Chuditch-2 project area were highly comparable to those observed at Barossa during baseline surveys (Jacobs 2016a).

Hydrocarbons and Chlorophyll-α were not detected above the laboratory LOR in any samples, while oil and grease was either detected in very low concentrations or below the LOR. Median sulphur concentration across water quality samples was 1100mg/L, where samples did not vary significantly in concentration. One outlier result was reported for sulphur in sample 9_M; however, this result was considered likely to represent laboratory reporting error.

APPENDIX 2: MARINE SEDIMENT QUALITY

The details results and analysis of the marine sediment quality are reproduced from the Chuditch-2 Environmental Baseline Survey (EBS) Technical Report dated March/April 2025 conducted by WA Marine Pty Ltd trading as O2 Marine, Western Australia. The data, figures, tables and information are reproduced from that report as primary information around the Chuditch-2 Appraisal Well Program.

Sediment Quality:

1. Particle Size Distribution (PSD)

Particle size distribution (PSD) results are presented in Table A2-1 and in Figure A2-1. Field sediment photos and descriptions are presented in Appendix 5. Sediment PSD was generally uniform across sampling locations, where coarse grained sand (500µm-2000µm) was typically the most dominant fraction, followed by silt (4µm-62µm). Medium grained sand generally comprised the lowest fraction of grains across all sample sites, and while no sites appeared to be significantly different in their PSD composition sites 13 to 17 appeared to have a higher content of medium grained sand (250µm-500µm) and a lower proportion of clay sized particles (<4µm) when compared with sites 1 to 10.

Table A2- 1-Sediment Particle Size Distribution (PSD) results. Cells highlighted in blue represent the dominant particle size fraction.

Site ID	Clay (<4 µm)	Silt (4-62 µm)	Sand (62-250 µm)	Medium Sand (250-500µm)	Coarse Sand (500-2000µm)	Cobbles (>2000µm)
Units	%					
1_ 1	12.27	23.15	14.04	3.37	36.28	10.89
1_ 2	9.57	19.33	16.9	3.69	30.79	19.72
2_ 1	12.83	24.12	13.79	3.97	32.41	12.88
2_ 2	10.84	23.61	14.27	1.76	38.35	11.17
3_ 1	14.07	28.63	10.19	0.83	29.63	16.65
3_ 2	12.13	27.55	18.88	2.58	24.42	14.44
4_ 1	12.86	26.88	17.11	3.99	23.27	15.89
4_ 2	8.71	28.3	19.69	2.77	20.83	19.7
5_ 1	7.53	16.14	14.01	2.74	39.66	19.92
5_ 2	6.95	15.15	14.21	2.67	40.98	20.04
6_ 1	10.17	21.55	10.54	1.87	37.05	18.82
6_ 2	8.16	17.42	13.63	3.94	29.45	27.4
7_ 1	9.57	20.14	14.7	2.26	32.84	20.49
7_ 2	7.5	15.58	15.34	3.34	39.37	18.87
10_ 1	12.26	28.06	15.59	1.52	22.61	19.96
10_ 2	8.07	18.13	22.67	7.53	27.67	15.93
13_ 1	7.11	11.63	10.59	2.89	48.25	19.53
13_ 2	6.26	13.57	16.1	11.57	34.37	18.13
14_ 1	6.22	15.9	20.2	15.59	33.24	8.85
14_ 2	5.12	11.96	19.87	14.9	34.23	13.92
15_ 1	8.57	19.97	24.74	14.18	23.5	9.04
15_ 2	6.67	15.86	25.16	14.06	27.03	11.22
16_ 1	5.93	13.58	19.06	14.67	36.19	10.57
16_ 2	7.56	16.18	16.26	10.54	26.71	22.75
17_ 1	6.24	13.47	18.83	15.17	34.25	12.04
17_ 2	8.02	15.95	17.95	13.26	33.04	11.78

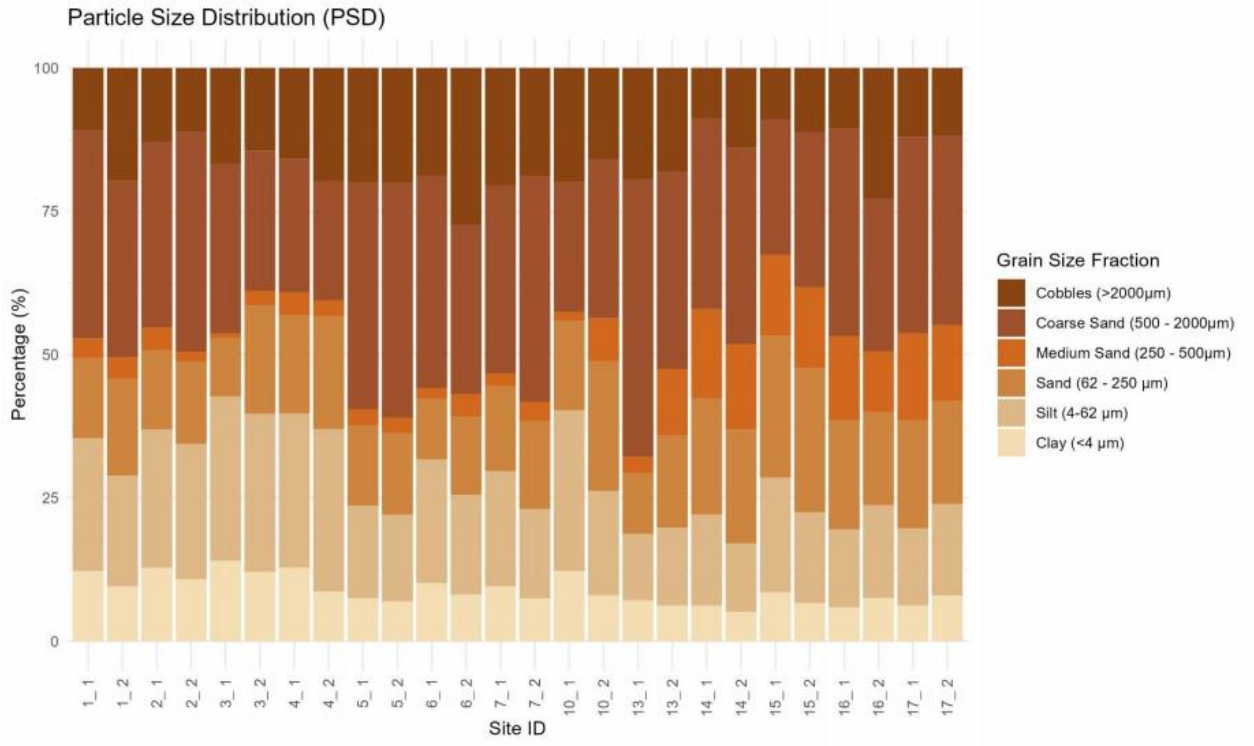


Figure A2- 1-Sediment Particle Size Distribution.

SundaGas Banda
Unipessoal Lda

Halona Serena Lda

2. Total Metals

Total metals concentrations are presented in Table 5. In summary:

- Mercury, cobalt, selenium, silver, and cadmium were reported below the LOR in all samples.
- Remaining metals were reported below ANZG (2018) DGVs where available.

Table A2- 2-Sediment Samples Total Metals Result

	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	V	Zn
Units	mg/kg															
DGV (ANZG 2018)	-	2	20	1.5	80	-	65	-	50	-	0.15	21	-	1	-	200
1_ 1	5700	< 2	3.4	< 1	16.0	< 5	< 5	7900	5.3	160	< 0.1	8.7	< 5	< 1	< 10	8.3
1_ 2	4500	< 2	2.5	< 1	13.0	< 5	< 5	6900	< 5	160	< 0.1	7.1	< 5	< 1	< 10	7.9
2_ 1	3500	5.4	2.5	< 1	9.0	< 5	< 5	5100	< 5	120	< 0.1	< 5	< 5	< 1	< 10	< 5
2_ 2	5500	< 2	4.0	< 1	15.0	< 5	< 5	8200	< 5	140	< 0.1	8.4	< 5	< 1	< 10	7.0
3_ 1	5000	< 2	< 2	< 1	13.0	< 5	< 5	6700	< 5	100	< 0.1	6.8	< 5	< 1	< 10	5.8
3_ 2	4400	2.1	2.9	< 1	12.0	< 5	< 5	7500	< 5	110	< 0.1	6.8	< 5	< 1	< 10	6.0
4_ 1	3600	< 2	< 2	< 1	10.0	< 5	< 5	5600	< 5	87	< 0.1	5.7	< 5	< 1	< 10	7.0
4_ 2	7700	< 2	2.7	< 1	21.0	< 5	6.2	11000	< 5	170	< 0.1	12.0	< 5	< 1	12.0	13.0
5_ 1	6400	< 2	3.7	< 1	19.0	< 5	5.6	11000	< 5	180	< 0.1	11.0	< 5	< 1	11.0	12.0
5_ 2	4500	< 2	2.8	< 1	13.0	< 5	< 5	6800	< 5	120	< 0.1	7.3	< 5	< 1	< 10	6.4
6_ 1	4000	< 2	< 2	< 1	11.0	< 5	< 5	5900	< 5	95	< 0.1	6.0	< 5	< 1	< 10	8.2
6_ 2	5100	< 2	2.3	< 1	14.0	< 5	< 5	6700	< 5	120	< 0.1	7.8	< 5	< 1	< 10	6.7
7_ 1	4600	< 2	3.3	< 1	13.0	< 5	< 5	6600	< 5	120	< 0.1	7.0	< 5	< 1	< 10	6.1
7_ 2	8500	5.6	6.3	< 1	26.0	< 5	7.8	16000	5.1	200	< 0.1	15.0	< 5	< 1	18.0	15.0
10_ 1	4100	< 2	< 2	< 1	9.8	< 5	< 5	5400	< 5	80	< 0.1	5.7	< 5	< 1	< 10	5.5
10_ 2	5900	< 2	< 2	< 1	16.0	< 5	5.0	8200	< 5	130	< 0.1	9.6	< 5	< 1	< 10	10.0
13_ 1	4000	< 2	2.3	< 1	11.0	< 5	< 5	5000	< 5	120	< 0.1	5.6	< 5	< 1	< 10	< 5
13_ 2	5800	< 2	4.1	< 1	17.0	< 5	< 5	8000	< 5	160	< 0.1	8.7	< 5	< 1	< 10	8.5
14_ 1	3900	< 2	2.7	< 1	9.6	< 5	< 5	6400	< 5	98	< 0.1	5.8	< 5	< 1	< 10	< 5
14_ 2	4800	< 2	2.2	< 1	13.0	< 5	< 5	6400	< 5	130	< 0.1	7.6	< 5	< 1	< 10	6.2
15_ 1	4500	< 2	< 2	< 1	12.0	< 5	< 5	6300	< 5	100	< 0.1	6.7	< 5	< 1	< 10	5.6
15_ 2	3200	< 2	< 2	< 1	7.8	< 5	< 5	4300	< 5	75	< 0.1	< 5	< 5	< 1	< 10	< 5
16_ 1	4600	< 2	< 2	< 1	12.0	< 5	< 5	6300	< 5	100	< 0.1	6.6	< 5	< 1	< 10	6.0
16_ 2	8100	< 2	3.3	< 1	22.0	< 5	6.7	12000	< 5	190	< 0.1	13.0	< 5	< 1	13.0	14.0
17_ 1	6900	< 2	3.1	< 1	20.0	< 5	5.7	10000	< 5	170	< 0.1	11.0	< 5	< 1	11.0	11.0
17_ 2	1900	< 2	2.0	< 1	5.7	< 5	< 5	3500	< 5	61	< 0.1	< 5	< 5	< 1	< 10	< 5
Median	4600.0	5.4	2.9	-	13.0	-	6.0	6700	5.2	120.0	-	7.3	-	-	12.0	7.0
Max	8500.0	5.6	6.3	-	26.0	-	7.8	16000	5.3	200.0	-	15.0	-	-	18.0	15.0
Min	1900.0	2.1	2.0	-	5.7	-	5.0	3500	5.1	61.0	-	5.6	-	-	11.0	5.5
St Dev	1542.1	2.0	1.0	-	4.7	-	1.0	2695.5	0.1	37.3	-	2.6	-	-	2.9	3.0

1: Values reported below the LOR have been halved for calculation of summary statistics

3. Moisture

Moisture content of sediment samples is presented in Table A2-3. In summary:

- Moisture content ranged between 33% (Site 3) and 44% (Site 13). The median moisture content across all sample sites was 39%, while there was a low standard deviation in % moisture content between samples (2%).

4. Oil and Grease

Oil and grease results are presented in Table A2-3. In summary:

- Oil and grease was generally reported below the LOR (<500 mg/kg) however was detected in low concentrations at Site 5 (690 mg/kg) and at Site 16 (630 mg/kg).

5. Sulphur

Sulphur results are presented in Table A2-3. In summary:

- Sulphur concentrations ranged between 2100 mg/kg (Site 17) and 6100 mg/kg (Site7).
- Median concentrations of sulphur across all samples was 3500 mg/kg, while the standard deviation was 1217 mg/kg.

6. Hydrocarbons

Results for hydrocarbons in sediments are presented in Table A2-3. In summary:

- BTEXN, Aliphatic and Aromatic Hydrocarbon, and Polyaromatic Hydrocarbon (PAH) concentrations were reported below the LOR at all sample sites
- Total recoverable hydrocarbons (TRH) were detected in low concentrations at several sample sites, normalized TRH concentrations were reported below the ANZG (2018) DGV.

Table A2- 3-Sediment Sample

Site	Moisture Content	Oil and Grease	Sulphur	TRH C10-C36 (Total)	TOC	TRH (C10-C36) Normalised to 1% OC
Units	%	mg/kg	mg/kg	mg/kg	%	mg/kg
DGV (ANZG 2018)	-	-	-	-	-	280
1_ 1	39	< 500	5600	57	6.9	8.3
1_ 2	38	< 500	3400	< 50	5.7	-
2_ 1	41	< 500	2900	< 50	6.6	-
2_ 2	38	< 500	4900	< 50	7.8	-
3_ 1	33	< 500	3300	55	7.6	7.2
3_ 2	36	< 500	2800	< 50	7.2	-
4_ 1	38	< 500	2200	< 50	6.4	-
4_ 2	40	< 500	4100	< 50	7.2	-
5_ 1	40	< 500	5400	< 50	8.5	-
5_ 2	40	690	4900	< 50	7.2	-
6_ 1	38	< 500	2700	< 50	11.0	-
6_ 2	39	< 500	4300	137	10.0	13.7
7_ 1	38	< 500	3600	< 50	9.6	-
7_ 2	38	< 500	6100	70	9.2	7.6
10_ 1	40	< 500	2500	470	7.6	61.8
10_ 2	39	< 500	3400	< 50	9.2	-
13_ 1	41	< 500	4400	480	8.3	57.8
13_ 2	44	< 500	6100	71	8.6	8.3
14_ 1	39	< 500	3100	< 50	7.6	-

Site	Moisture Content	Oil and Grease	Sulphur	TRH C10-C36 (Total)	TOC	TRH (C10-C36) Normalised to 1% OC
Units	%	mg/kg	mg/kg	mg/kg	%	mg/kg
DGV (ANZG 2018)	-	-	-	-	-	280
14_ 2	39	< 500	4100	< 50	11.0	-
15_ 1	39	< 500	3300	< 50	7.1	-
15_ 2	39	< 500	2300	< 50	6.8	-
16_ 1	38	630	3300	< 50	5.1	-
16_ 2	37	< 500	5200	< 50	10.0	-
17_ 1	39	< 500	5100	160	10.0	16.0
17_ 2	39	< 500	2100	72	7.1	10.1
Median	39	-	3500	25	7.6	10.1
Max	44	-	6100	480	11	61.8
Min	33	-	2100	25	5.1	7.2
St Dev	2	-	1217	122	1.5	22.1

1: Values reported below the LOR have been halved for calculation of summary statistics

Discussion and Conclusion on Marine Sediment Quality

Sediment Quality Samples

Sediments collected across the project area were generally consistent in physical attributes and properties, predominantly brown/grey in color, with shell fragments and minimal visible organic content. They primarily comprised of sand-sized grains (60 µm-2000 µm) but also contained moderate proportions of clay and silt- sized particles.

When compared against ANZG (2018) default guideline values (DGVs), total metals concentrations in sediment was low, with values generally reported below the DGVs or the LOR. While limited data exists to contextualize total metals concentrations in the region, Jacobs (2015b) generally reported similar to slightly higher natural levels of metals. Sulphur content in marine sediment samples ranged between 2100 and 6100 mg/kg, with a median value of 3500 mg/kg.

Hydrocarbon results from sediment samples collected during this survey were generally reported below the LOR. TRH (C10-C36) was however detected in very low concentrations in a number of samples with detections assumed to be of natural origin based on the limited ability for any anthropogenic influence in the project area. In all sediment samples TRH concentrations normalized against organic carbon content in sediments were reported below ANZG (2018) DGVs.

APPENDIX 3: MARINE FAUNA

A detail information of marine fauna including habitat and characteristics of benthic habitats and detail information on the characteristics and abundances of the filter feeders encountered during the EBS are placed described below.

1. Benthic Infauna

Benthic infauna identification, classification, and analysis is presented in Table A3-1

Table A3- 1-Number of still images with sediment burrows and/or holes and associated density

	No Sediment	Sparse (<10)	Low (10-20)	Moderate (20-50)	High (>50)
T10	0	15	3	2	0
T11	2	18	0	0	0
T12	0	13	1	3	3
T15	2	15	3	0	0
T17	0	17	3	0	0
T1A	0	11	4	4	1
T1B	0	12	5	3	0
T4	0	7	5	6	2

The marine benthic survey collected 192 individuals from 62 taxonomic morphological species. The three most abundant species across all sites were the bristle worm Anthuridae (n=13), the Litocorsa sp1 (n=11) and,the Apseudidae (n=11).

2. Diversity Indices

Four indices are selected: Margalef's species richness, Shannon-H species diversity, Evenness, and Dominance-D. Since only two samples were collected at each survey site, statistical variation analysis could not be conducted. This limits the ability to statistically confirm if there are differences in communities across the survey sites.

Across the survey area, the species richness index (Margalef) had the lowest value at sites 3-1 (0.0) and 5-2 (0.0) and the highest value at site 2-1 (6.636) (Figure A3-1a). The species diversity index (Shannon-H) had the lowest value at sites 3-1 (0.0) and 5-2 (0.0) and the highest value at site 2-1 (3.086) (Figure A3-1b). The evenness index and the dominance index are correlated. All the sites presented very high evenness values between 0.913 and 1.0, indicating a complete even distribution (Figure A3-1c). Dominance values were low across most sites, from 0.05 to 0.5 (Figure A3-1d). This indicates an even distribution of individual counts among different species, with no single species dominating the communities across the survey area. However, samples 3-1 and 5-2 had complete evenness (value=1) and complete dominance (value=1), due to only one individual from one taxon being collected.

3. Faunal Composition

The MDS plot of all samples had a stress value of 0.15, which gives a potentially useful ordination, although it should not be relied upon in great detail (Figure A3-2). Most sites were grouped with a 5% similarity in the faunal community. Sites 3, 15, and 16 were

outliers from the main group. However, without three sample replications, it is difficult to determine the cause of these outliers.

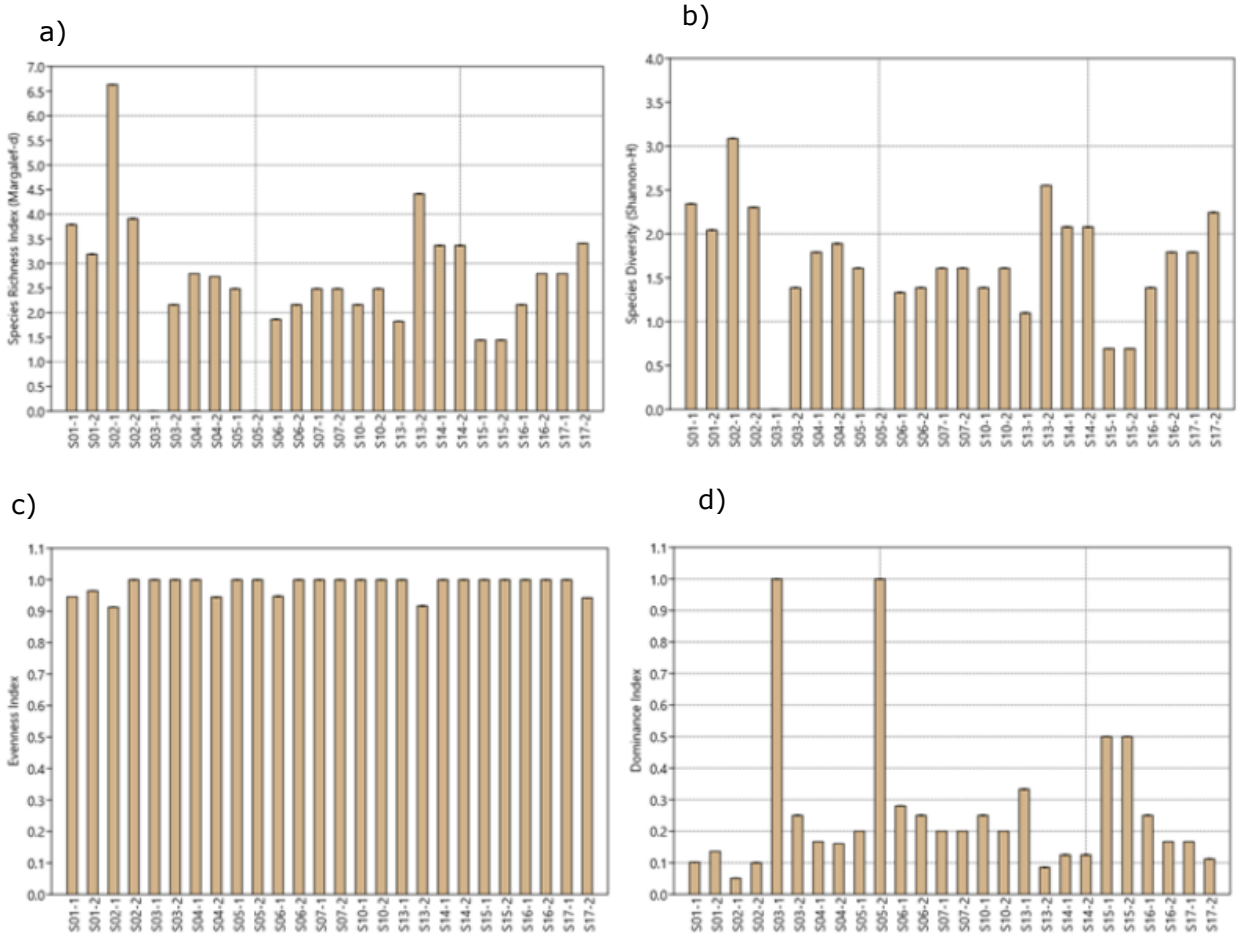


Figure A3- 1-a) Species richness index (Margalef's-d) for all sites b) Species diversity (Shannon-H) for all sites c)Evenness values for all sites d)Dominance-D values for all sites

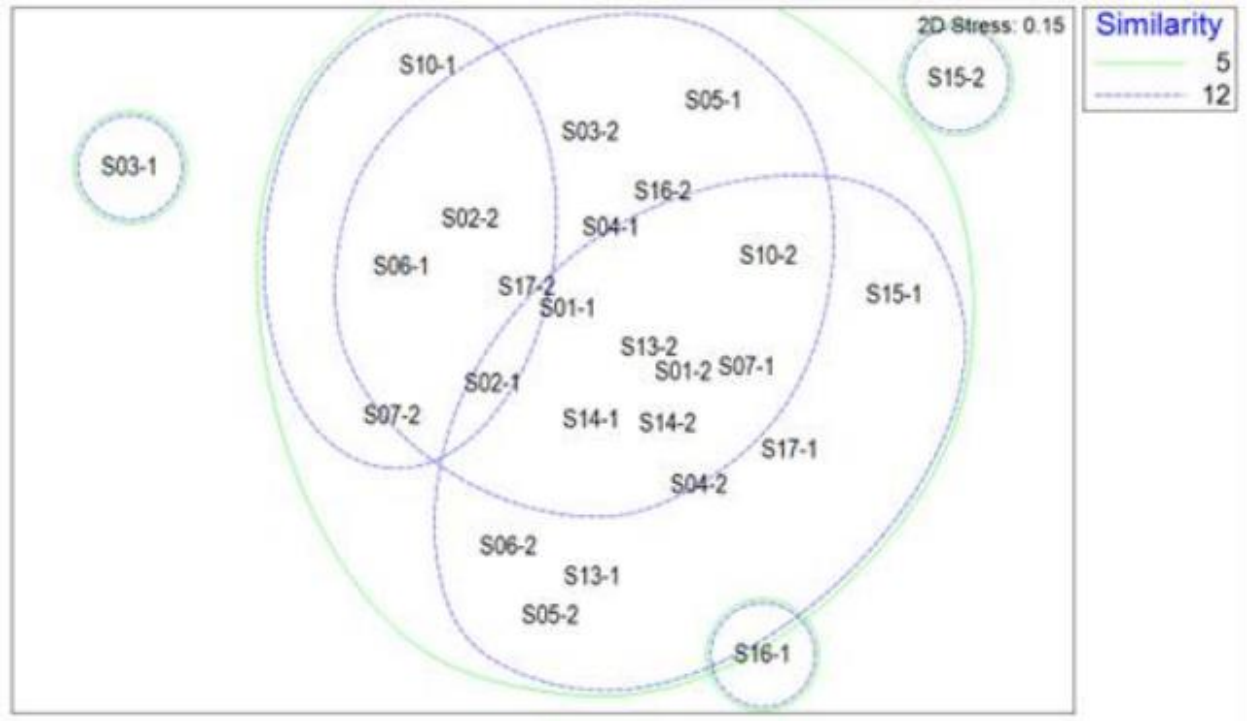


Figure A3- 2-MDS ordination of faunal composition

Discussion and Conclusion on Benthic Infauna

Benthic infauna samples collected from replicate sediment samples at the Chuditch-2 project area consisted of a total of 192 individuals from 62 taxonomic, morphological groups, with the most abundant species across all sites being the Anthuridae, the Litocorsa sp1, and the Apseudidae.

Statistical analysis of benthic infauna was limited as only 2 samples were collected from each site, meaning variation analysis could not be accurately conducted. Samples from sites 3 and site 5 had the lowest species richness and diversity while sample 1 from site 2 reported the highest. The majority of infauna sample locations reported an even distribution in individual counts among different species, while no single species was observed to be more dominant across any of the sites or samples. Benthic community assemblage across the survey area was therefore considered to be heterogenous, whilst patchy.

APPENDIX 4: BENTHIC HABITAT ASSESSMENT

A detail information of benthic habitat assessment around the Chuditch-2 drilling well during the EBS are placed described below.

Analysis of the towed video footage collected by ROV classified a total of 4,542 points from the eight (8) transects. The number and proportion of classified points and the distribution of these classifications are presented for substrate (Table 8; Figure 6), dominant biota (Table 9; Figure 7), percent cover (Table 10; Figure 8), and an overall benthic habitat class (Table 11; Figure 9). The number of still images with sediment burrows and/or holes and associated their associated density are presented in Appendix I.

Of the 4,542 classified points, 3,772 were assigned substrate information, which largely comprised of Sand / Mud (59.4%), while similar proportions were assigned as Rock (20.9%) and Pebble / Gravel – Rubble (49.1%), with Cobbles (0.6%) the only other substrate classification recorded.

Mixed Filter Feeders comprised 96.4% of all points assigned with dominant biota information, with Black & Octocorals (2.3%), Sponges (cup) (0.7%), Black & Octocorals - Fan (2D) (0.4%), and Sponges (mixed) (0.1%) collectively comprising the remaining 3.4%.

Information of percent cover of biota was assigned to 3,692 points, with 53.5% classified as Sparse/Low in cover. Relatively similar proportions of benthic biota cover were classified as Moderate (15.5%), Bare (14.1%), and High (12.2%), while 4.2% was classified as Dense, and 0.4% of classified points had None Recorded assigned to percent cover.

A broad summary classifying the benthic habitat was assigned to 3,752 points which was largely allocated to the Sediment with Sparse Filter Feeders (48.6%) and Filter Feeders (mixed habitat) (21.1%) classifications, followed by Reef with Mixed Assemblage (14.9%), Bare Sediment (bioturbated) (12.9%), and Bare Sediment (2.6%).

1. Substrate

Table A4- 1-Number of classified points (substrate).

Substrate	Number of classified points	Proportion of classified points
Cobbles (>64mm)	21	0.6%
Rock	787	20.9%
Pebble / Gravel - Rubble (<64mm)	722	19.1%
Sand / Mud	2 242	59.4%
Total	3,772	100.0%

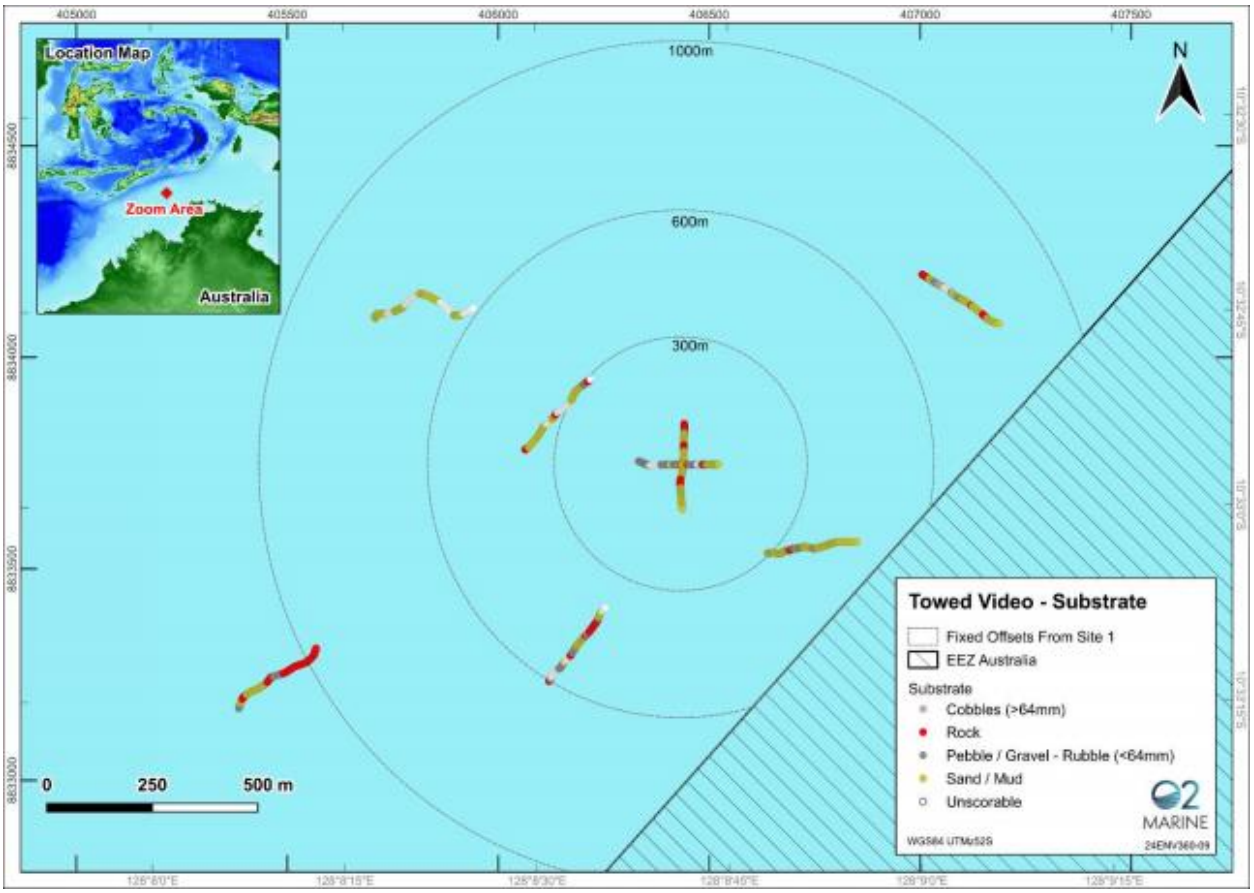


Figure A4- 1-Overview of substrate classifications assigned along each transect.

2. Dominant Biota

Table A4- 2-Number of classified points (dominant biota)

Dominant biota	Number of classified points	Proportion of classified points
Black & Octocorals - Fan (2D)	16	0.4%
Black & Octocorals	86	2.3%
Mixed Filter Feeders	3,528	96.4%
Sponges (cup)	25	0.7%
Sponges (mixed)	5	0.1%
Total	3,660	100.0%

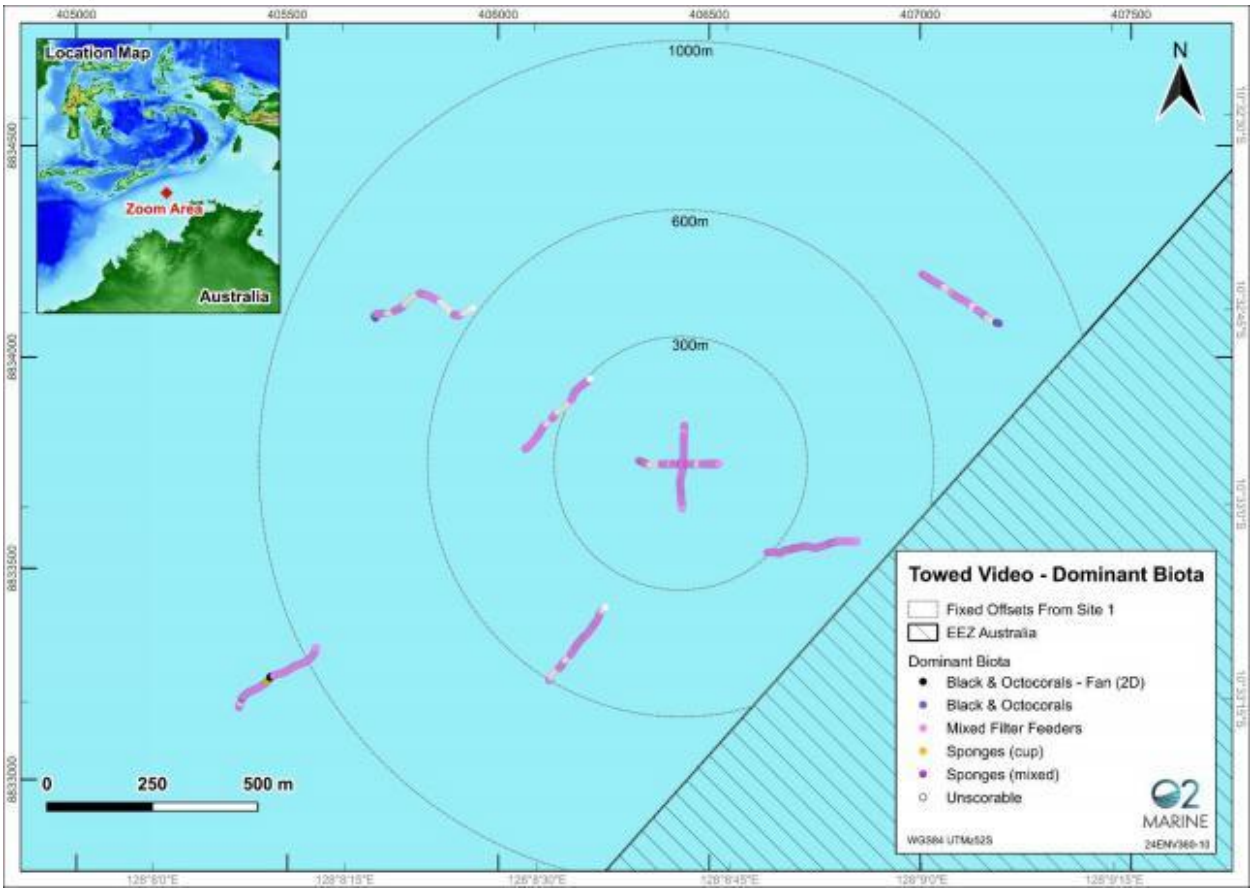


Figure A4- 2-Overview of dominant biota classifications assigned along each transect

3. Percent Cover (Biota)

Table A4- 3-Number of classified points (percent cover)

Percent cover (biota)	Number of classified points	Proportion of classified points
None Recorded	16	0.4%
Bare (<1%)	522	14.1%
Sparse/Low (1%-10%)	1,975	53.5%
Moderate (10%-25%)	573	15.5%
High (25%-75%)	451	12.2%
Dense (>75%)	155	4.2%
Total	3,692	100.0%

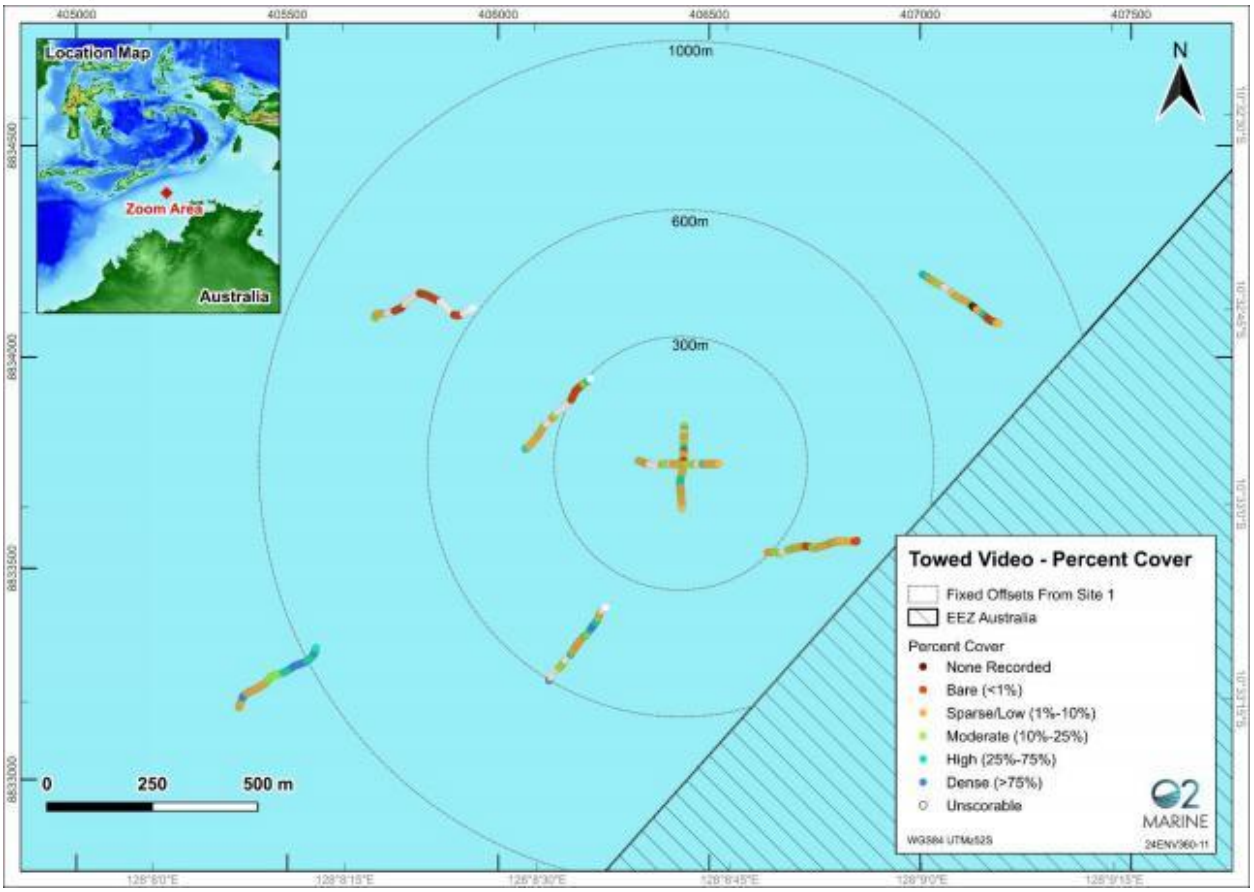


Figure A4- 3-Overview of total biota percent cover assigned along each transect

4. Habitat Classification

Table A4- 4-Number of classified points (habitat class)

Habitat class	Number of classified points	Proportion of classified points
Filter Feeders (mixed habitat)	792	21.1%
Reef with Mixed Assemblage	558	14.9%
Sediment with Sparse Filter Feeders	1,822	48.6%
Bare Sediment	96	2.6%
Bare Sediment (bioturbated)	484	12.9%
Total	3,752	100.0%

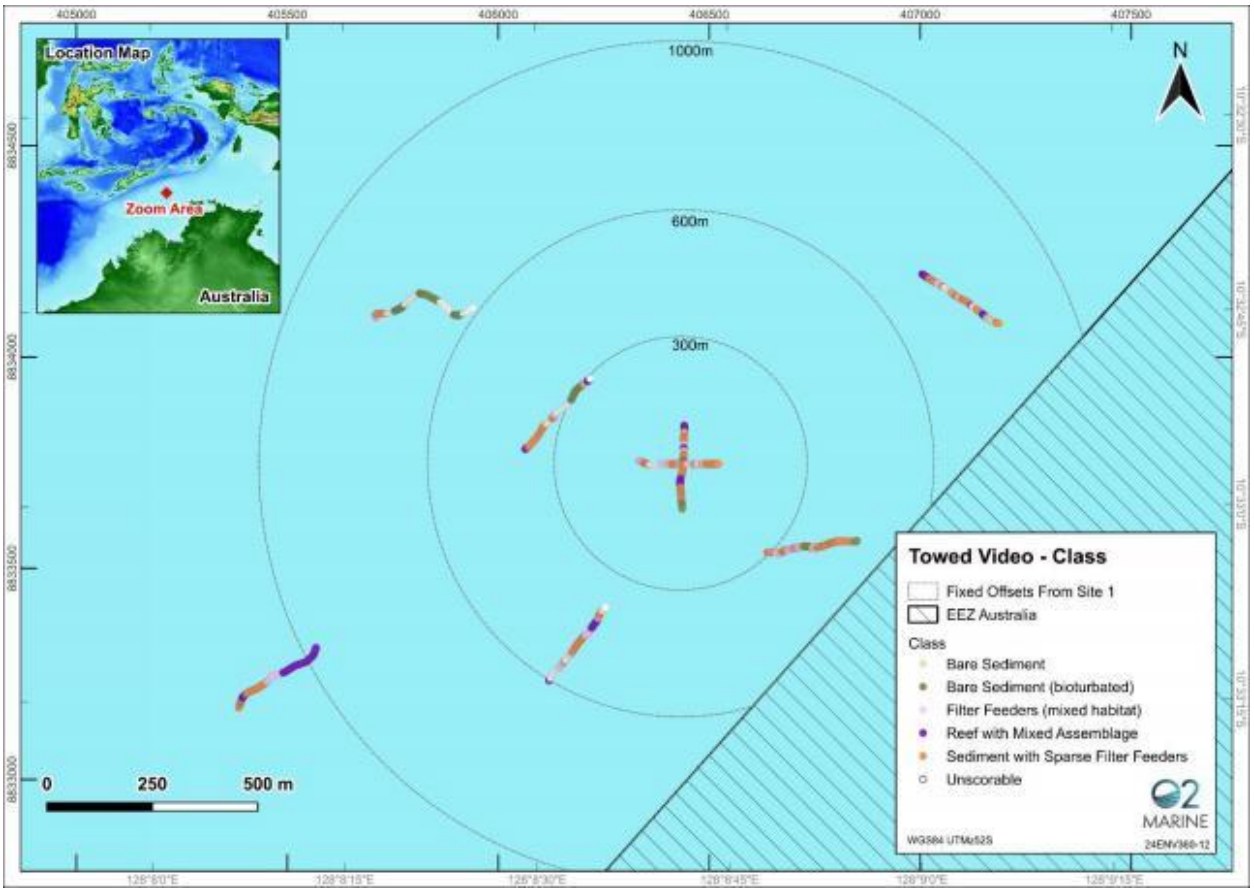


Figure A4- 4-Overview of habitat classifications assigned along each transect

5. Benthic Cover

Analysis of 20 still images along each transect (n = 160) was undertaken to provide additional benthic habitat information. Benthic habitat characteristics were classified into four broad categories with their relative proportion of cover along each transect presented in Figure 12. Soft Substrate was the dominant characteristic across all transects, comprising between 81.8% (T11 and T15) and 99.2% (T10). Filter Feeders were the only other characteristic which was recorded along all transects within the still images, with benthic cover highest at T15 (7.7%) and T11 (7.2%), and lowest at T10 and T1B (both 0.8%). Hard Substrate was highest within T11 (10.7%) and T15 (10.5%), with cover decreasing at T12 (9.5%), T1B (5.0%), and T17 (2.2%), while Hard Substrate was absent from all other transects. Benthic characteristics which were classified as 'unconfirmed' were absent from T15 and T17, comprised <0.1% at T10, and ranged between 0.1% (T12) and 0.4% (T1B) for the remaining transects.

Discussion and Conclusion on Benthic Habitat Assessment

Substrate along T1A was largely classified as Pebble / Gravel - Rubble with areas of Sand / Mud and Rock found on the eastern portion of the transect. The substrate along T1B was

dominated by Sand / Mud with segments of rock and a small area of Pebble / Gravel - Rubble. The substrate along both, T1A and T1B, was dominated by Mixed Filter Feeder assemblages which were predominantly comprised of relatively equal dominance of filter feeders such as sponges and octocorals. The percent cover of biota along T1A was predominantly sparse (1-10%) although cover increased to moderate (10-25%) and high (25-75%) over areas of Rock or Rubble. Similarly, areas of substrate classified as Rock or Rubble along T1B aligned with areas of moderate and high biota cover, whereas Sand / Mud aligned with sparse or bare (<1%) cover.

The benthic habitat along transect T1A fluctuated between Sediment with Sparse Filter Feeders and Filter Feeders (mixed habitat), with some areas along T1A unscorable, while all five habitat classes were present along T1B. The distribution of Filter Feeders (mixed habitat) along T1A was typically found with Pebble / Gravel - Rubble and Rock substrate, while Sediment with Sparse Filter Feeders typically aligned with Sand / Mud substrate along both, T1Aand T1B, with areas of Bare Sediment (bioturbated) along T1B also aligning with the distribution of Sand / Mud. Areas with Rock substrate along T1B aligned with the Reef with Mixed Assemblage habitat classification which also aligned with the areas of moderate and dense biota cover. The composition of benthic habitat features along T1B and T1A tend to be reflected in the benthic cover analysis which found 5.0% of hard substrate along T1B whereas hard substrate was not recorded within T1A.

The benthic habitat along T17 was primarily classified as Sediment with Sparse Filter Feeders, and Bare Sediment (bioturbated), with Reef with Mixed Assemblage at each end. Filter Feeders (mixed habitat) was classified in two small segments along the transect, while a considerable proportion of the transect was classified as Unscorable. Sand / Mud substrate aligned with Sediment with Sparse Filter Feeder habitat and Bare Sediment (bioturbated) habitat, while Rock substrate aligned with Reef with Mixed Filter Feeder habitat. Majority T17 comprised of bare and sparse/low biota cover. Moderate and high biota cover was classified in areas of Reef with Mixed Filter Feeder or Filter Feeders (mixed habitat). All dominant biota classified along T17 was categorised as Mixed Filter Feeders. The results of benthic cover from the downward facing camera suggests a composition of 96.0% soft substrate with 2.2% hard substrate and 1.8% filter feeders.

T04 comprised relatively featureless benthic habitat with Sediment with Sparse Filter Feeders the dominant benthic habitat class, with Filter Feeders (mixed habitat) subdominant and Bare Sediment (bioturbated) classifications least abundant. Small areas of Rock and Pebble / Gravel - Rubble were found in areas of Filter Feeders (mixed habitat), however, Sand / Mud comprised majority of the substrate along T04. Biota cover was predominantly <10% (bare or sparse/low) although areas classified as Filter Feeders (mixed assemblage) typically ranged between 10-25% (moderate) cover. Dominant biota was consistently classified along T04, all of which was classified as Mixed Filter Feeders. The lack of hard substrate was reflected in benthic cover results (where it was not recorded), whilst soft substrate comprised 95.3% and filter feeders accounted for 4.4%, with 0.3% remaining unconfirmed.

The proportion of benthic habitat along T12 was relatively evenly distributed between Sediment with Sparse Filter Feeders, Filter Feeders (mixed habitat), Reef with Mixed Assemblage, and Unscorable. Rock and Pebble / Grave - Rubble comprised majority of the substrate wit marginally lower composition of Sand / Mud classified. The considerable presence of hard substrate along T12 aligned with biota cover typically ranging between moderate and high cover, with areas of dense (>75%) biota cover was recorded over some areas classified as Reef with Mixed Assemblage. The remaining biota cover was scored as sparse/low or unscorable. Mixed Filter Feeders were the dominant biota along T12 with the only other dominant biota information pertaining to areas classified as unscorable. These results were largely reflected in the benthic cover results which recorded a considerably low cover of soft substrate (85.4%) while hard substrate (9.5%) and filter feeders (5.0%) scored considerably high in cover.

Sediment with Sparse Filter Feeders was the dominant benthic habitat classified along T15, with areas of Reef with Mixed Assemblage, Filter Feeders (mixed habitat), and Bare Sediment also classified along with areas which were Unscorable in classification. As expected, Sand / Mud was the dominant substrate along T15, with the proportion of substrate classified as Cobbles, Rock, and Pebble / Gravel - Rubble, all relatively similar. High biota cover was recorded over areas with Rock substrate, while Cobbles and Pebble / Gravel - Rubble mostly facilitated moderate biota cover. The remaining cover of biota was largely sparse/low, with some areas being recorded with <1% (bare) biota cover, or with no biota cover (none recorded). Mixed Filter Feeders were the dominant biota along majority of the classified areasofT15, with the exception of a small portion which was classified with Black & Octocorals as the dominant biota. Benthic cover results were also somewhat reflective for T15 which recorded the equal lowest cover of soft substrate (81 .8%), the highest cover of filter feeders (7.7%) and a considerable cover of hard substrate (10.5%).

Majority of the benthic habitat along T10 was classified as Unscorable. Where habitat characteristics were scored, Bare Sediment (bioturbated) was the dominant classification followed by Sediment with Sparse Filter Feeders. Sand / Mud was the only substrate classified along T10, which largely aligned with bare (<1%) biota cover, with a small area of sparse/low cover, all of which, was assigned to Mixed Filter Feeders as dominant biota. The lack of biota and hard substrate was evident in the benthic cover results which classified 99.2% of T10 as soft substrate, with only filter feeders (0.8%) and unconfirmed (<0.1%) also scored.

Majority of the benthic habitat along T11 was classified as Reef with Mixed Assemblage, which aligned with Rock substrate, with Sediment with Sparse Filter Feeders, Filter Feeders (mixed habitat), and Bare Sediment (bioturbated) also classified. Filter Feeders (mixed habitat) comprised of a mixed between Rock and Pebble / Gravel - Rubble substrates, whilst Bare Sediment (bioturbated) was over Sand / Mud substrates. Sediment with Sparse Filter Feeders was predominantly over Sand / Mud, with a small proportion aligning with Pebble / Gravel-Rubble substrate. Relatively structurally complex reef features (classified as Reef with Mixed Assemblage) on the northeast portion of T11 are indicated by the biota cover which alternates between high and dense, before declining to moderate over Filter Feeders

(mixed habitat) and then to sparse/low over Sediment with Sparse Filter Feeders. Mixed Filter Feeders were assigned to the dominant biota along majority of T11 with small areas of dominance of gorgonian corals (Black & Octocorals - 2D Fan), cup sponges, and mixed Black & Octocorals recorded. T11 also recorded the lowest soft substrate (81.8%) in the benthic cover results, with the highest cover of hard substrates (10.7%) and considerable cover of filter feeders (7.2%).

Majority of the benthic habitat across the eight transects comprise of relatively featureless structure and provides little habitat for the wider area. However, areas were found along T1B, T15, T12, T17 and T11 which would be considered highly valuable for across the local ecosystem as they are structurally complex, provide enhanced biodiversity, and appear to be inconsistently found across the transects. Limited regional published datasets are available to further contextualise the results from this survey, however limited benthic bathymetry available note that greater diversity of substrate type further afield from the project area would most certainly host more structurally complex and diverse BCH in comparison.

6. Marine Fauna Observations

No opportunistic marine megafauna were observed by O2 Marine field staff or Offshore Unlimited vessel crew during survey operations.

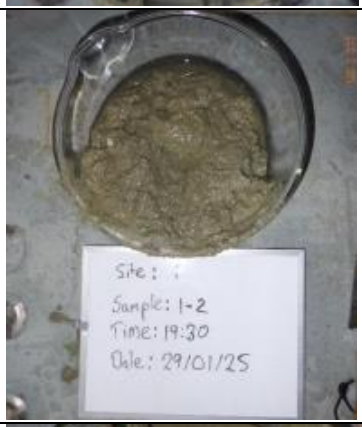
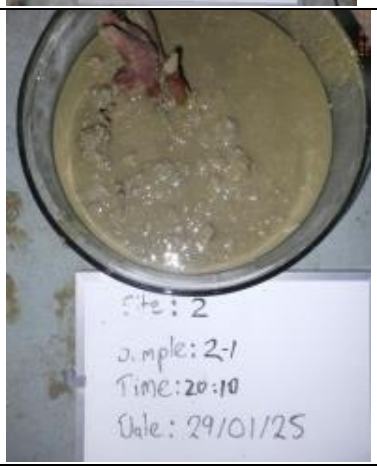
Discussion and Conclusion on Marine Fauna Observations

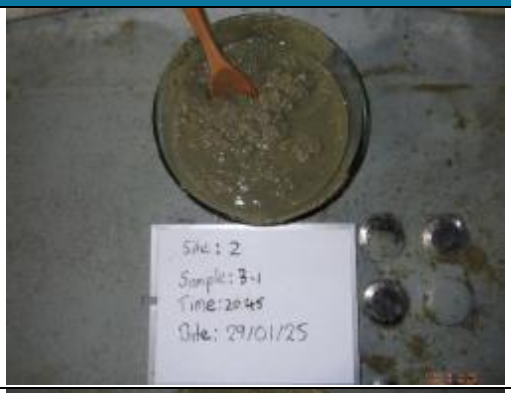
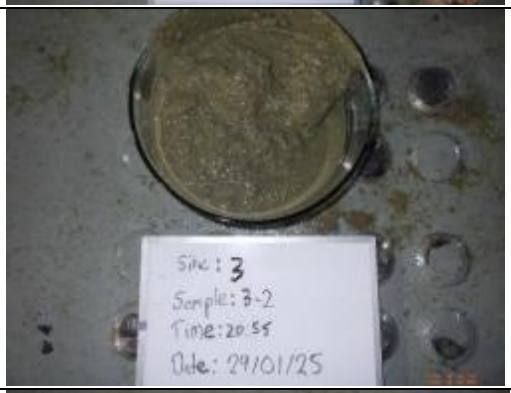
No marine megafauna were observed during field survey operations. Field survey sites were restricted to a small remote area and therefore there was limited opportunity to observe marine megafauna. Fauna observations were generally limited to small fish and sea snakes; however, these were rarely observed.

APPENDIX 5: SEDIMENT SAMPLE PHOTOS

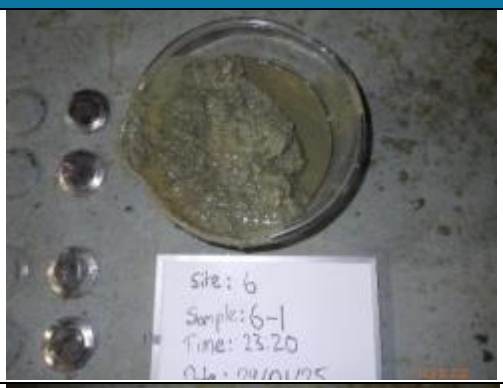
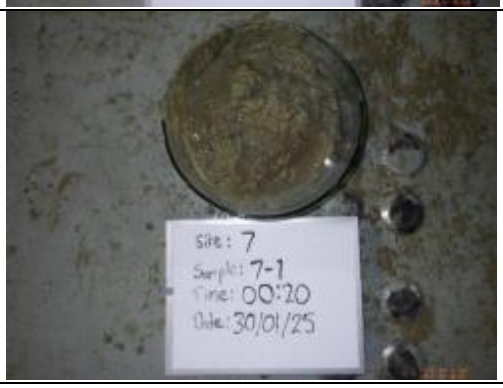
A detail information of sediment sample phots around the Chuditch-2 drilling well during the EBS are placed described below.

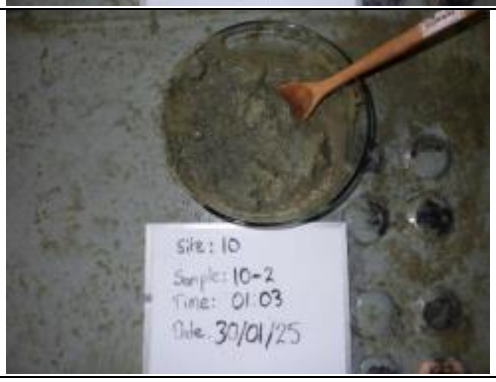
Table A5- 1-Sediment sample photos and descriptions

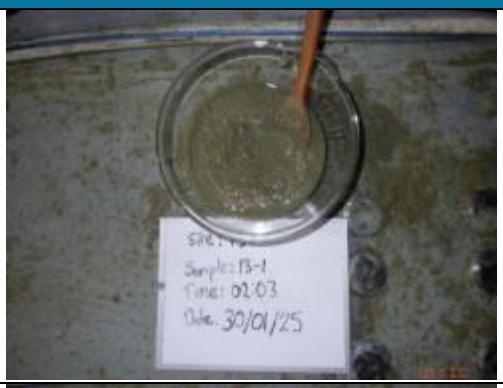
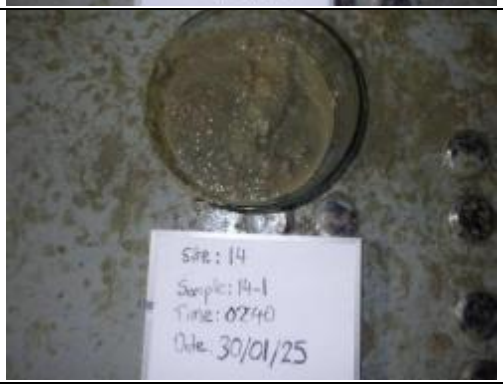
Sample ID	Description	Photo
1_1	Brown/Grey, moderate plasticity, mixed grain sediment, fine sand/moderate sand, shell grit present, no visible organic matter or odour.	
1_2	Brown/Grey, moderate plasticity, mixed grain sediment, fine sand/moderate sand, shell grit present, no visible organic matter or odour.	
2_1	Brown/Grey, moderate plasticity, mixed grain sediment, fine sand/moderate sand, shell grit present, no odour.	

Sample ID	Description	Photo
3_1	Brown/Grey, moderate plasticity, mixed grain sediment, fine sand/moderate sand, shell grit present, no visible organic matter or odour.	
3_ 2	Brown/Grey, medium/high plasticity, fine sand/clay, shell grit present, no visible organic matter or odour.	
4_ 1	Brown/Grey, medium/high plasticity, fine sand/clay, shell grit present, no visible organic matter or odour.	

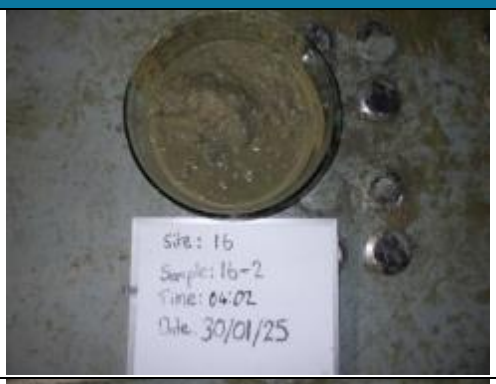
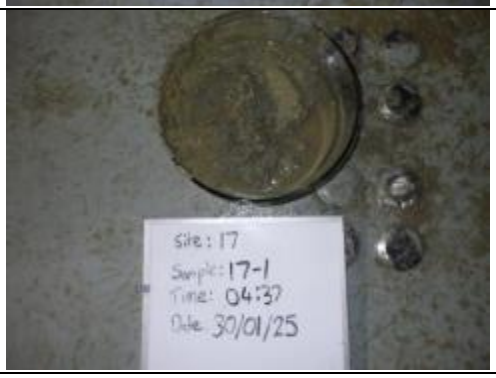
Sample ID	Description	Photo
4_2	Brown/Grey, low plasticity, medium/coarse sand, high shell grit content, some filter feeders present, no odour.	
5_1	Brown/Grey,low plasticity, mixed grain size, shell grit present, no visible organic matter or odour.	
5_2	Brown, moderate plasticity, mixed grain sediment, silt/moderate sand, shell grit present, no visible organic matter or odour.	

Sample ID	Description	Photo
6_1	Brown/grey, moderate plasticity, mixed grain sediment, silt/moderate sand, shell grit present, no visible organic matter or odour.	
6_2	Brown/grey, moderate plasticity, mixed grain sediment, silt/moderate sand, shell grit present, no visible organic matter or odour.	
7_1	Brown/grey, moderate/high plasticity, mixed grain sediment, silt/moderate sand, shell grit present, no visible organic matter or odour.	

Sample ID	Description	Photo
7_2	Brown/grey, moderate/high plasticity, mixed grain sediment, silt/moderate sand, shell grit present, no visible organic matter or odour.	
10_1	Brown/grey/olive, high plasticity, fine sand/silt, shell grit present, no visible organic matter or odour.	
10_2	Brown/grey/olive, high plasticity, fine sand/silt, shell grit present, no visible organic matter or odour.	

Sample ID	Description	Photo
13_1	Brown/grey/olive, moderate plasticity, fine sand/silt, shell grit present, no visible organic matter or odour.	
13_2	Brown/grey/olive, moderate plasticity, fine sand/silt, shell grit present, no visible organic matter or odour.	
14_1	Brown/olive, moderate plasticity, fine sand/silt/mixed, shell grit present, no visible organic matter or odour.	

Sample ID	Description	Photo
14_2	Brown/olive, moderate plasticity, fine sand/silt/mixed, shell grit present, no visible organic matter or odour.	
15_1	Brown/olive, high plasticity, fine sand/silt/mixed, shell grit present, no visible organic matter or odour.	
15_2	Brown/olive, high plasticity, fine sand/silt/mixed, shell grit present, no visible organic matter or odour.	
16_1	Brown/olive, moderate plasticity, fine, medium grain sediment, shell grit present, no visible organic matter or odour.	

Sample ID	Description	Photo
16_2	Brown/olive, moderate plasticity, fine, medium grain sediment, shell grit present, no visible organic matter or odour.	
17_1	Brown/olive, moderate plasticity, fine, medium grain sediment, shell grit present, no visible organic matter or odour.	
17_2	Brown/olive, moderate plasticity, fine, medium grain sediment, shell grit present, no visible organic matter or odour.	

APPENDIX 6: PARTICIPANT REGISTRY