A-6 Drilling Program

Environmental Impact Assessment

October 2016

A-6 Drilling Program

Environmental Impact Assessment

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Client: Woodside Energy (Myanmar) Pte. Ltd (Woodside)		Project No: 0360592			
Summary: This document presents the *Environmental Impact Assessment Report* as required under the study *A-6 Drilling Program.*		Date: 28/10/16 Approved by:  Craig A Reid *Partner*			
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Environment Conservation Department
Ministry of Natural Resources and Environmental Conservation
Building 53, Nay Pyi Taw
Republic of the Union of Myanmar

Attention : Director General

Date : 28 October 2016
Ref. : MPRL / OFF / LET - 101 / 16

Subject : Letter of Endorsement for Myanmar A-6 Environmental Impact Assessment Report (Drilling)

Dear Director General,

The Block A-6 Joint Venture of MPRL E&P Pte Ltd., Woodside Energy (Myanmar) Pte Ltd. and Total E&P Myanmar (the "A-6 JV") refers to the Environmental Impact Assessment (EIA) Report, including the environment management plan, submitted herewith in respect of the proposed drilling program in Block A-6.

The EIA Report was prepared by Environmental Resources Management (ERM) with support from national consultant F Guard in accordance with the requirements of applicable laws, consistent with the Environmental Impact Assessment Procedure (No. 616/2015) and under the guidance of the Ministry of Natural Resources and Environmental Conservation (MONREC).

MPRL E&P Pte Ltd. on behalf of the Joint Venture for the Offshore Block A-6 of MPRL E&P Pte Ltd., Woodside Energy (Myanmar) Pte Ltd. and Total E&P Myanmar confirms in respect of the proposed drilling program that the EIA report:

a) has been presented in a manner which is accurate and complete;
b) has been prepared in a manner which complies with applicable laws including the Environmental Impact Assessment Procedure (No. 616/2015) [and the Terms of Reference for the EIA]; and
c) acknowledges operations in A-6 in respect of the proposed drilling program are required to comply with commitments, mitigation measures and the environmental management plan in the EIA Report.

Yours sincerely,

U Myo Tin
General Manager

Copy : file, MPRL E&P / Woodside Energy Ltd / Total E&P Myanmar

UMT /dr

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
1.0	Executive Summary	Section 1 of EIA Report (Myanmar Language version also included)
2.0	Introduction	Section 2 of EIA Report
2.1	Presentation of the Project Proponent	Section 2.2 of EIA Report
2.2	Presentation of the Environmental and Social Experts	Section 2.4 of EIA Report
2.3	Presentation of the Health Experts for Projects with Health Impacts	As this Project is located over 21 miles (35 km) from the nearest coastline and any sensitive health receptors, there are not likely to be any health impacts. In addition to the distance of the Project from the nearest coastline, the temporary and short duration of the Project and lack of hazardous materials used or wastes generated will limit the potential for health impacts. Therefore, health experts have not been included.
3.0	Policy, Legal and Institutional Framework	Section 3 of EIA Report
3.1	Corporate Environmental and Social Policies (if applicable)	Section 3.1 of EIA Report
3.2	Policy and Legal Framework,	Section 3.2 of the EIA Report
	including existing applicable laws and rules,	Section 3.2.2 of the EIA Report
	International Conventions, Treaties and Agreements, and	Section 3.2.3 of the EIA Report
	national and international standards and guidelines	Section 3.2.4 and 3.4 of the EIA Report
3.3	Contractual and other Commitments	Section 3.3.2 of the EIA Report (Production Sharing Contract with MOGE)
3.4	Institutional Framework	Section 3.3 of the EIA Report
3.5	Project's Environmental and Social Standards	Section 3.4 of the EIA Report
3.6	Health Standards for Projects with Health Impacts	As this Project is located over 21 miles (35 km) from the nearest coastline and any sensitive health receptors, there are not likely to be any health impacts. In addition to the distance of the Project from the nearest coastline, the temporary and short duration of the Project and lack of hazardous materials used or wastes generated will limit the potential for health impacts. Therefore, health experts have not been included.

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
4.0	Project Description and Alternative Selection	Section 4 of the EIA Report
4.1	Project Background	Section 4.1.1 of the EIA Report
4.2	Project Location, overview map and site layout maps	Section 4.1.2 of the EIA Report
4.3	Project Development and Implementation Time Schedules	Section 4.1.4 of the EIA Report
4.4	Description of the project size, installations, technology, infrastructure, production processes	Section 4.1.5 of the EIA Report. Description of the project size - presented in Section 4.1.2 and 4.1.3. Description of the installations - this is not applicable as the Project will include no fixed installations. Technology - the Project will use technology and best available techniques in order to reduce environmental impacts, including the use of a dynamically positioned mobile offshore drilling unit (MODU). See Section 4.2 for vessels used. See 4.1.5 for drilling activities. Infrastructure - not applicable as the Project will include no fixed infrastructure. Production processes - the Project is not at the production stage.
	use of materials and resources	Section 4.2 of the EIA Report and Section 4.3 of the EIA Report.
	generation of waste, emissions and disturbances, including the devises and measures to control emissions and disturbances	Section 4.4 of the EIA Report. Note that the devises and measures to control emissions and disturbances are also listed in Section 6.4.1 to Section 6.4.6 of the EIA Report - under Existing / In place controls and Additional mitigation, management and monitoring headings.
	all together with overview maps and site layout maps and design drawings for each Project phase (pre-construction, construction, operation, decommissioning, closure and post-closure)	Figures included in Section 4. Note that due to the nature of the Project; not all Project Phases are applicable - only the operational phase applies to this Project)
4.5	Description of the selected Alternative(s) by Project phase (pre-construction, construction, operation, decommissioning, closure and post-closure)	Section 4.5 of the EIA Report. Note that due to the nature of the Project; not all Project Phases are applicable - only the operational phase applies to this Project)
4.6	Comparison and Selection of the preferred Alternatives	Section 4.5 of the EIA Report
5.0	Description of the Surrounding Environment	Section 5 of the EIA Report
5.1	Setting the Study Limits	Section 5.1 of the EIA Report

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
5.2	Methodology and Objectives	Section 5.2 of the EIA Report.
5.3	Public Administration and Planning: Identification and summary of the main relevant elements in socio-economic development plans, spatial plans, and sector plans at Union Government, State or Region, City and Township levels	Section 5.5.1 of the EIA Report. This presents the demographics for the closest land region; Ayeyarwady Region. As this Project will have no onshore activities or impacts; these plans are not relevant to the Project.
5.4	Legally protected national, regional or state areas, including without limitation: (i) forest conservation areas (including biodiversity reserved areas); (ii) public forests; (iii) parks (including marine parks); (iv) mangrove swamps; (v) any other sensitive coastal areas; (vi) wildlife sanctuaries; (vii) scientific reserves; (viii) nature reserves; (ix) geophysically significant reserves; (x) any other nature reserve nominated by the Minister; (xi) protected cultural heritage areas; and (xii) protected archaeological areas or areas of historical significance.	Section 5.4.9 of the EIA Report. It should be noted that none of these designated areas are located within the Project Area or Area of Influence.
5.5	Physical Components: Description with data and maps of:	Section 5.3 of the EIA Report
	(i) topography;	Section 5.3.3 of the EIA Report provides the bathymetry (underwater topography)
	(ii) water resources;	Section 5.3.2 of the EIA Report provides metocean and hydrography data. Note that as this is an offshore project; onshore water resources are not relevant to include.
	(iii) geology and soils, hydrology/hydrogeology;	Section 5.3.3 of the EIA Report
	(iv) environmental quality;	N/A as not onshore Project
	(v) climate;	Section 5.3.1 of the EIA Report
	(vi) vegetation cover; and	N/A as not onshore Project
	(vii) natural hazards including earthquakes, tsunamis, extreme weather events, flooding, drought, wildfires and others	Section 5.3.4 presents the relevant natural hazards such as tsunami, earthquakes and cyclones
5.6	Biological Components:	Section 5.4 of the EIA Report (including associated figures)

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
	Descriptions and maps on fauna and flora including abundance, spatial distribution of rare, endangered and vulnerable species, and species of economic and health/nutritional values	Section 5.4 of the EIA Report - Offshore deepwater habitats in the Area of Influence - Coastal habitats in Study Area (coral reef, mangroves, seagrass) - Submerged Shoals - Plankton - Fish assemblages - Marine mammals - Marine turtles - Seabirds - Protected and environmentally sensitive areas
	and maps and description of valued or sensitive environmental areas and habitats	Section 5.4.9 of the EIA Report and associated figures.
5.7	Infrastructure and Services: Location and size or capacity of transport infrastructure, public utilities and services	N/A - as this Project is located offshore and there is no transport infrastructure, public utilities and services
5.8	Socio-Economic Components: Income and livelihoods, living conditions and access to public services and natural resources, land use maps, population distribution maps, maps and charts of other socio-economic indicators such as poverty, employment and education	Section 5.5 of the EIA Report which includes: - Administration and demography - Livelihood and economy - Fishing operations and resources - Shipping lanes - Other petroleum exploration and production Note: as this is an offshore Project which is located 21 miles (35 km) from the coastline and is unlikely to have any onshore impacts - the social baseline has been tailored for the offshore environment and parameters such has land use have not been included.
5.9	Public Health Components: Mortality and morbidity, occurrence of diseases, accidents and injuries, and social health determinants	As this Project is located over 21 miles (35 km) from the nearest coastline and any sensitive health receptors, there are not likely to be any health impacts. In addition to the distance of the Project from the nearest coastline, the temporary and short duration of the Project and lack of hazardous materials used or wastes generated will limit the potential for health impacts. Therefore, health experts have not been included.

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
5.1	Cultural Components: Description and maps of cultural, historical, and religious sites, structures and objects, and objects with high aesthetic value; description of traditional knowledge and beliefs, and cultural practices	Section 5.6 of the EIA Report
5.11	Visual Components including where applicable landscape, city scape and sea scape using three dimensional models	Section 5.7 of the EIA Report. Note that this is an offshore Project located over 21 miles (35 km) from the nearest coastline therefore no visual impacts are anticipated.
6.0	**Impact and Risk Assessment and Mitigation Measures**	Section 6 of the EIA Report
6.1	Impact and Risk Assessment Methodology	Section 6.1 of the EIA Report
6.2	Impact and Risk Identification, Assessment and Mitigation. For each Project phase (pre-construction, construction, operation, decommissioning, closure, and post-closure):	Section 6.4.1 to 6.4.6 of the EIA Report. Note that due to the nature of the Project; not all Project Phases are applicable - only the operational phase applies to this Project). Impacts are split between Project activities.
6.2.1	Identification and assessment of potential Environmental Impacts including (i) physical, biological, social, socio-economic, health, cultural, and visual impacts; (ii) potential impacts on climate change such as greenhouse gas emissions and loss of carbon sinks or stocks; and (iii) identification of impacts of climate change on the Project based on available climate change predictions from designated national authorities or international scientific research bodies	Section 6.4.1 to 6.4.6 of the EIA Report - under *Source of Impact* heading
6.2.2	Identification and assessment of the likelihood and severity of natural and industrial hazards relevant to the Project	Section 6.4.1 to Section 6.4.6 of the EIA Report - under *Significance of Impact* heading
6.2.3	The design, layout, functioning, management and implementation of appropriate impact and risk mitigation measures	Section 6.4.1 to Section 6.4.6 of the EIA Report - under *Existing / In place controls* and *Additional mitigation, management and monitoring* headings
6.2.4	Characterization and assessment of any Residual Impacts and risks and comparison with applicable regulations, standards and guidelines	Section 6.4.1 to Section 6.4.6 of the EIA Report - under *Significance of Residual Impact* heading
6.2.5	Comprehensive monitoring plan	Section 6.4.7 of the EIA Report (overview) and detailed in Section 8 of the separate EMP Report.

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
6.3	Relevant maps, aerial photos, satellite images in proper scale clearly indicating the location of sources of Adverse Impacts, the spatial and temporal distribution of such impacts and with reference to the Description of the Surrounding Environment, the components that are likely to be impacted and the nature of the impacts.	Figures throughout the report show the Project Area - in which the majority of the potential impacts are likely to be located. Other impacts have been qualitatively assessed and cannot be shown on temporal or spatial on maps.
7.0	**Cumulative Impact Assessment**	Section 7 of the EIA Report
7.1	Methodology and Approach	Section 7.1 of the EIA Report
7.2	Cumulative Impact Assessment	Section 7.3 of the EIA Report
7.2.1	Brief description and map of relevant existing and future private and public projects and developments	Section 7.2 of the EIA Report and Figure 7.1 of the EIA Report
7.2.2	Identification and assessment of the potential cumulative impacts on the components in the surrounding environment and the Project's contribution to such impacts	Section 7.3 of the EIA Report
7.2.3	Determination of the leverage and influence that the Project may have over the significant and project related cumulative impacts	Section 7.3 of the EIA Report
7.2.4	Description of measures to mitigate the Project's contribution to the cumulative impacts	Section 7.3 of the EIA Report
8.0	**Environmental Management Plan**	*Separate Submission - Woodside EMP Report for Drilling Program in A-6*
8.1	Project Description by Project phase (pre-construction, construction, operation, decommissioning, closure and post-closure)	Section 3 of the EMP Report
8.2	Project's Environmental, Socio-economic and, where relevant, Health Policies and Commitments, legal requirements and institutional arrangements	Section 5 of the EMP Report
8.3	Summary of Impacts and Mitigation Measures	Section 6 and 7 of the EMP Report and Table 6.1 of the EMP Report details the mitigation measures in full.

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
8.4	Overall budget for implementation of the EMP	Section 13 of the EMP Report
8.5	Management and Monitoring Sub-Plans by Project phase (pre-construction, construction, operation, decommissioning, closure and post-closure); the Management and Monitoring Sub-Plans shall address and satisfy all relevant environmental and social management and monitoring issues such as but not limited to noise, vibrations, waste, hazardous waste, wastewater and storm water, air quality, odor, chemicals, water quality, erosion and sedimentation, biodiversity, occupational and community health and safety, cultural heritage, employment and training, and emergency response	Section 10 of the EMP Report provides the contents of the following plans: - Emergency Response Plan - Medical Emergency Response Plan - Shipboard Oil Pollution Emergency Plan Note that in response to a comment received from ECD on the Scoping Report, Section 10 of the EMP includes information on how the Emergency Response Plan includes information on Well blow out during drilling. Section 6.4.5 and 6.4.6 of the EIA also describe the existing/in place controls to control/minimise impacts from unplanned spills. The Monitoring and Reporting to be undertaken in presented in Section 8 and 9 respectively. Note that due to the nature of the Project; not all Project Phases are applicable - only the operational phase applies to this Project).
8.6	Content of each Sub-Plan	Section 10 of the EMP Report provides the contents of the following plans: - Emergency Response Plan - Medical Emergency Response Plan - Shipboard Oil Pollution Emergency Plan
8.6.1	Objectives	Section 2.2 of the EMP Report
8.6.2	Legal Requirements	Section 4 of the EMP Report
8.6.3	Overview maps and site layout maps, images, aerial photos, satellite images	Figure 1.1 of the EMP Report. A satellite image of the Project provided in Annex 5.1 of the EIA Report
8.6.4	Implementation Schedule	Section 13 and Table 7.1 of the EMP Report
8.6.5	Management Actions	Table 7.1 provides all Management actions under the column *Specific Action*
8.6.6	Monitoring Plans	Section 8 and 9 of the EMP Report presents the Monitoring Program for the Project including the reporting requirements to ECD every 6 months.

	EIA Procedure Article 63	Relevant Section of Woodside A6 EIA and EMP Reports
8.6.7	Projected Budgets and Responsibilities	Section 13 of the EMP Report provides the budget and Section 8.1 and Table 7.1 of the EMP Report provides the roles and responsibilities.
9.0	**Public Consultation and Disclosure**	Section 8 of the EIA Report
9.1	Methodology and Approach	Section 8.2 of the EIA Report
9.2	Summary of consultations and activities undertaken	Section 8.3 of the EIA Report
9.3	Results of Consultations	Section 8.4 of the EIA Report
9.4	Further ongoing Consultations	Section 8.5 of the EIA Report
9.5	Disclosure	Section 8.5 of the EIA Report

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
%	Percentage
2D	Two-dimensional
3D	Three-dimensional
ALARP	As Low As Reasonably Practicable
API	American Petroleum Institute
ASEAN	Association of South-East Asia Nations
BOP	Blow-out preventer
cm	Centimetre
CH_4	Methane
CIA	Cumulative Impact Assessment
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COLREG	Convention on the International Regulations for Preventing Collisions at Sea (COLREG) 1972
CO_2	Carbon dioxide
CO_2E	CO_2 Equivalent
dB	Decibels
DoF	Department of Fisheries
ECD	Environmental Conservation Department
EDS	Emergency Disconnect Sequence
E Guard	E Guard Environmental Services Co. Ltd
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIA Procedure	Myanmar Environmental Impact Assessment Procedures 2015
EMP	Environmental Management Plan
ERM	Environmental Resources Management
FGDs	Focus Group Discussions
ft	Feet
GAD	General Administration Department
GHG	Greenhouse gas
GPS	Global Positioning System
HSE	Health, Safety and Environment
Hz	Hertz
IAPP	International Air Pollution Prevention
IFC	International Finance Corporation
IFC PS	IFC Performance Standard
IMO	International Maritime Organisation
IMS	Invasive Marine Species
$Inch^3$	Cubic inches
IOGP	International Association of Oil and Gas Producers
IOPP	International Oil Pollution Prevention
IPIECA	International Petroleum Industry Environmental Conservation Association

Acronym	Definition
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-Tropical Convergence Zone
IUCN	International Union for the Conservation of Nature
JV	A-6 Joint Venture
KBA	Key Biodiversity Area
kHz	Kilo hertz
km	Kilometres
km^2	Square kilometres
m	Metres
m^3	Cubic metres
MARPOL	International Convention for the Prevention of Pollution from Ships
MGO	Marine gas oil
MIC	Myanmar Investment Commission
MFF	Myanmar Fisheries Federation
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre
mm	Millimetre
MMscf	Millions of standard cubic feet
MMOs	Marine Mammal Observers
MODU	Mobile Offshore Drilling Unit
MOEE	Ministry of Electricity and Energy
MOGE	Myanmar Oil and Gas Enterprise
MONREC	Ministry of Natural Resources and Environmental Conservation
MPRL E&P	MPRL E&P Pte Ltd
ms-1	Metres per second
$MtCO_2e$	total million tonnage of CO_2 equivalent
NADF	Non-Aqueous Drilling Fluid
NEQ Guidelines	National Environmental Quality (Emissions) Guidelines
NGO	Non-governmental Organisation
nm	Nautical Miles
NOAA	National Oceanographic and Atmospheric Administration
N_2O	Nitrous oxide
OCNS	Offshore Chemical Notification Scheme
OPEP	Oil Pollution Emergency Plan
µPa	micropascal
P&A	Plugged and abandoned
PAPs	Project Affected Peoples
PPR	Project Proposal Report
ppt	Parts per thousand
PSC	Production Sharing Contract
PTS	Permanent Threshold Shift
PTW	Permit to Work

Acronym	Definition
ROV	Remotely operated vehicle
SCE	Solids Control Equipment
SDS	Safety Data Sheets
SEEMP	Ship Energy Efficiency Management Plan
SEP	Stakeholder Engagement Plan
SOLAS	The International Convention for the Safety of Life at Sea 1974
SOPEP	Shipboard Oil Pollution Emergency Plan
tCO_2e	tonnage of CO_2 equivalent
Total E&P	Total E&P Myanmar
TTS	Temporary Threshold Shift
UNEP	United National Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change 1992
VSP	Vertical Seismic Profiling
WBDF	Water Based Drilling Fluid

1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This document is the Environmental Impact Assessment (EIA) Report for a proposed drilling program in Block A-6 (A-6) in the Rakhine Basin, the Union of Myanmar (Myanmar) (the Project). This EIA Report has been prepared for the approval of the Ministry of Natural Resources and Environmental Conservation (MONREC), in compliance with the Myanmar Environmental Impact Assessment Procedure (EIA Procedure) 2015 (Notification No. 616 / 2015; dated 29 December 2015).

As per the EIA Procedure, this project requires an EIA Report and an Environmental Management Plan (EMP) to be prepared and submitted to MONREC.

Woodside Energy (Myanmar) Pte Ltd (Woodside), on behalf of the Block A-6 Joint Venture (JV, see *Table 1.1*), is proposing to undertake a drilling program in A-6 commencing in 2017 (*Figure 1.1*). The Project covers a proposed drilling program of up to six wells over the period 2017-2019, although not all of these wells may be drilled.

The 2017 program will include up to two wells, one of which is a firm well and one of which is optional (1). Depending on the outcome from the 2017 drilling, and subject to decisions by the A-6 JV, an additional four wells may be drilled during 2018 and 2019.

In 2013, Woodside entered a farm-in agreement with MPRL E&P Pte Ltd (MPRL E&P) with respect to A-6 in the Rakhine Basin. In 2015, Total E&P Myanmar (Total E&P) farmed in to A-6. Woodside, Total E&P and MPRL E&P hold 40%, 40% and 20% interests respectively in A-6 (the JV). Woodside is a joint operator.

In accordance with the EIA Procedure, the first stage of the Project involved screening. This included the submission of the Project Proposal Report (PPR) to Myanmar Oil and Gas Enterprise (MOGE), for onward submission to MONREC. The PPR was prepared and submitted in June 2016. After consideration, the Environmental Conservation Department (ECD) of MONREC responded to the PPR in August 2016, instructing Woodside to undertake an EIA for the proposed drilling activities. Woodside then prepared and submitted a Scoping Report which included the Terms of Reference for the EIA Study. This was submitted to MOGE on 7 September 2016.

Woodside, on behalf of the JV, commissioned Environmental Resources Management (ERM) to undertake the EIA Study for the Project. ERM engaged the national environmental consultant E Guard Environmental Services Co. Ltd (E Guard) to provide local Myanmar expertise.

This document is the EIA Report for the Project in A-6. A separate EMP has also been prepared alongside this report for submission to, and approval by, MONREC.

The details of the Project are summarised in *Table 1.1*.

(1) An optional activity such as the second 2017 well will only be executed if the JV decides to proceed at some point in the future.

Table 1.1 Summary of Proposed Project Details

	Details
Block	A-6, Offshore Myanmar as per *Figure 1.1*
Joint Venture Participants	Woodside – 40 % (Joint operator and operator of the Project) Total E&P – 40% (Non-operator of the Project) MPRL E&P – 20% (Non-operator of the Project)
Project Area and distance from coastline	At its closest point, the A-6 Project Area is about 21 miles (35 km) from the Myanmar coastline.
Previous activities in A-6 and operator for the activity	Two-dimensional (2D) marine seismic survey in 2009 (MPRL E&P) Three-dimensional (3D) marine seismic survey in 2010 (MPRL E&P) Drilling of Pyi Thar-1 well in 2012 (MPRL E&P) Drilling of Pyi Thar-1ST well in 2012 (MPRL E&P) 3D marine seismic survey in 2013 (Woodside) Drilling of Shwe Yee Htun-1 well in 2016 (Woodside) 3D marine seismic survey in April 2016 (Woodside)
Scope of proposed exploration activities for which approval is sought	2017 – Drilling of two wells, one firm and one optional. 2018/19 - The potential drilling of four wells. This is dependent on the outcomes of the 2017 drilling and has not yet been decided by the JV.
Consultants for proposed activity	ERM and E Guard

1.2 POLICY AND REGULATORY FRAMEWORK

Under the *Environmental Conservation Law* and the *Environmental Conservation Rules* of the Republic of the Union of Myanmar, Woodside is required to undertake an EIA study for the Project and obtain MONREC approval of the EIA Report for the proposed exploration activities.

The Project will be undertaken in line with a number of national and local standards and laws. Local laws relating to EIA include:

- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- Myanmar National Environmental Quality (Emission) Guidelines (2015) (NEQ Guidelines)
- EIA Procedure.

A full list of laws and their relevance to the Project is provided in *Section 3*. With the release of the final EIA Procedure (29 December 2015), the NEQ Guidelines were also released. These Guidelines provide the basis for regulation and control of noise and air emissions and effluent discharges from projects in order to prevent pollution and protect the environment and public health. These standards are noted to be based on the standards as recommended by the International Finance Corporation (IFC) General EHS Guidelines (2007) [(2)].

[(2)] Environmental, Health and Safety (EHS) Guidelines – General EHS Guidelines: April 2007, International Finance Corporation, World Bank Group

1.3 PROJECT DESCRIPTION AND ALTERNATIVES

A-6 is located in offshore Myanmar. At its closest point, the A-6 Project Area is about 21 miles (35 km) from the Myanmar coastline. A-6 encompasses the continental shelf, slope and abyssal plain over shallow nearshore, to deep offshore, waters comprising water depths ranging from 32 feet (ft) (10 metres (m)) up to about 7870 ft (2400 m).

Woodside proposes to drill up to two wells in 2017, one of which is a firm well, and one of which is an optional well. Depending on the outcome from the proposed 2017 drilling, an additional four wells may, subject to the agreement of the JV, be drilled over 2018 and 2019. All wells will be drilled within the Project Area shown in *Figure 1.1* (i.e. outboard of 21 miles (35 km) from the coastline) but the specific locations of the wells are also yet to be finalised.

A dynamically positioned mobile offshore drilling unit (MODU) will be used to drill the wells and will be supported by three to four vessels. A typical well will be drilled to a total depth ranging from 6560 ft (2000 m) to 8202 ft (2700 m) (total vertical depth in metres below sea bed). Offshore drilling involves the MODU sending a drill bit to the seabed to drill a small diameter hole in the seabed. The total depth of a well is set to target suspected oil or gas accumulations under the seabed. The well will use both water based drilling fluid (WBDF) and non-aqueous drilling fluid (NADF) for drilling. WBDF and drill cuttings will be discharged at the seabed. Cuttings containing NADF will be returned to the drill rig and treated on-board to reduce the oil on cuttings before discharge overboard.

As part of the Project Design Phase, consideration was given to potential alternatives for Project activities; such as the 'no project', the use of different types of drilling fluids, drill cutting disposal methods, well locations and drill vessel types. The option to not proceed with the Project was considered, however, should gas be found in a sufficiently significant quantity to be commercially viable at some future time, the Project could have beneficial impacts on Myanmar and the local communities. Safety and technical requirements dictate the requirements for a NADF drilling fluid system as opposed to a wholly WBDF drilling fluid system. Alternative disposal options (cuttings re-injection, ship to shore or ship to disposal at another deep water location) for the drill cuttings were assessed and considered not to be technically or financially viable alternatives. Well locations are driven by the geological targets selected in advance, as well as the permit specific commitments to drill wells. As such, there is no viable alternative to the proposed well location. The Project Area is located about 21 miles (35 km) from coastal environmental and social receptors in the Ayeyarwady Region and as such is unlikely to impact these receptors. The Project will use a dynamically positioned MODU, which is considered to be the most viable Project alternative based on a combination of water depth and metocean conditions in the Project location, technical drilling and commercial consideration, and likely availability for the drilling schedule.

1.4 BASELINE CONDITIONS

The Study Area for the baseline covers offshore A-6, as well as its immediate surroundings, and extends to the Rakhine Coastal Region (including the western coastline of Ayeyarwady Region and the southern coastline of Rakhine State; i.e., the extent shown in *Figure 1.1)*. The Project activities will most likely take place in a water depth of about 7870 ft (2400 m) and at a minimum distance of about 21 miles (35 km) from the nearest Myanmar coastline area. Therefore, the focus of the baseline information is on the offshore, open ocean environment and associated deep water habitats.

Climatic conditions are determined by the seasonal monsoons and transition periods. A-6 encompasses physical habitats ranging from the continental shelf, slope and abyssal plain over shallow, nearshore to deep, offshore waters.

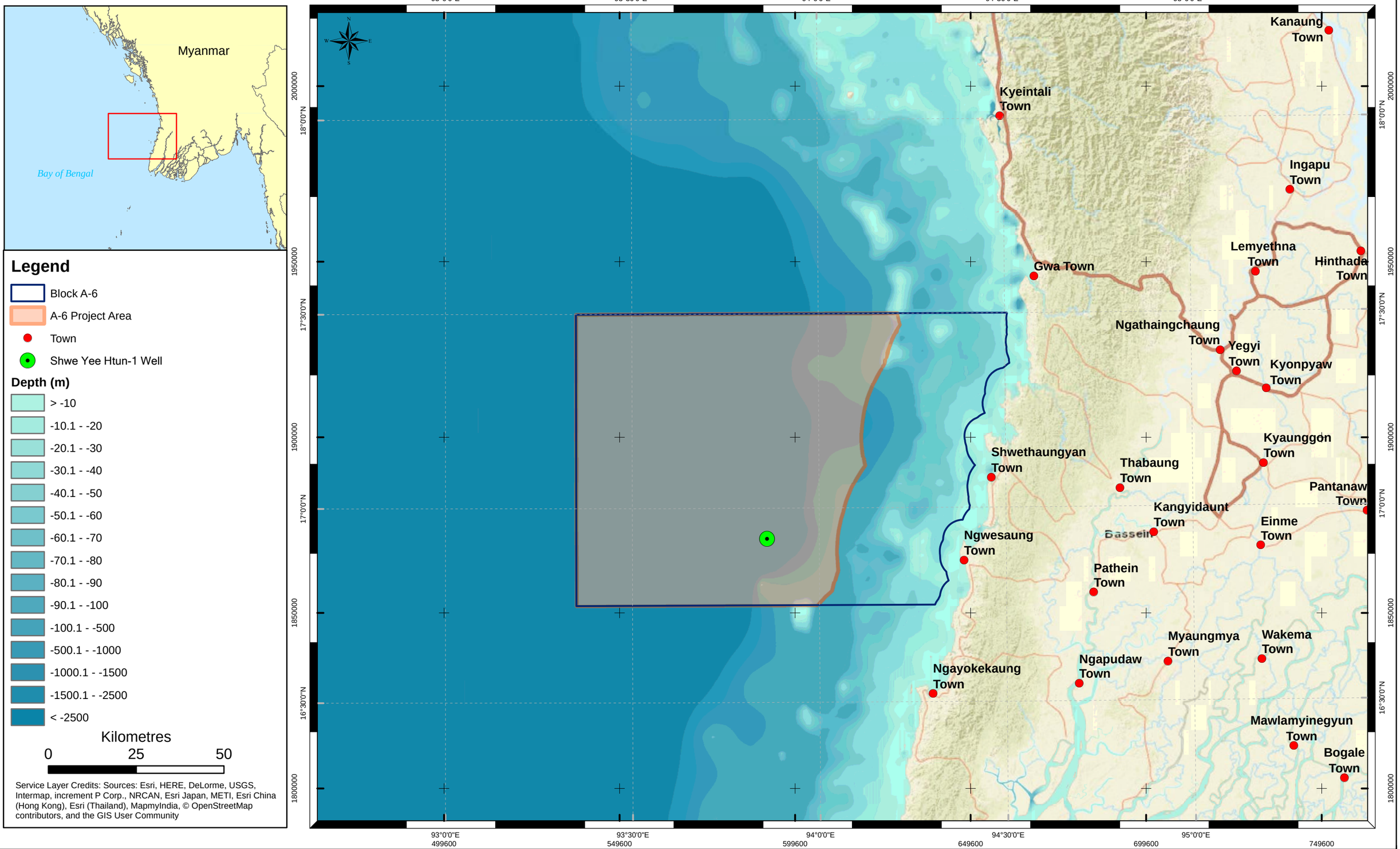

Figure 1.1

Location of A-6 and Project Area

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Date: 30/9/2016

Environmental Resources Management

ERM

Associated biological communities typical of deepwater soft sediment include seabed benthic invertebrates comprising macrofauna living within the sediments (infauna) and on the seabed (epifauna). There are no sensitive habitats or protected areas within the Project Area of A-6.

Fish communities that may be present in the Study Area range from coastal or reef-associated species, to demersal (bottom living) and pelagic (open water) species and may occupy a range of habitats. A-6 is located in the open water habitat where fish species are expected to include commercially important finfish such as species of Clupeidae (herring and anchovies) and Scombridae (mackerel and tuna) and demersal species such as snapper, thread fin/Indian salmon and croaker. From surveys conducted in 2015 (3) and data collected from consultations with local fishermen for the Project in Ayeyarwady Region (Pathein, Thabaung and Chaungthar) during 2015 and 2016, the majority of fish species known to occur in waters of the Ayeyarwady Region are generally not considered of conservation concern on the International Union for the Conservation of Nature (IUCN) Red List.

A number of marine mammal and turtle species that are globally and/or nationally protected species are known to occur in Myanmar waters. Marine mammal species such as large, migratory/open-water whales: include the blue whale (*Balaenoptera musculus*) (Endangered), fin whale (*Balaenoptera physalus*) (Endangered) and sperm whale (*Physeter macrocephalus*) (Vulnerable) have been reported as well as small cetacean species and the protected dugong recorded in coastal areas. Five IUCN-listed threatened marine turtle species occur. United Nations Environment Program (UNEP) data suggest that olive ridley turtles may be nesting along the Rakhine Coastal Region which encompasses the coastline of Ayeyarwady Region bordering the northeast of A-6. These data also suggest that green turtles may nest on beaches surrounding/in proximity to Ngwe Saung Town. Marine fauna observations made during past exploration activities indicate a relatively low presence of cetacean and turtle species in A-6, and these fauna are most likely transiting if present in the Project Area. During the 2016 seismic survey in A-6 (April and May 2016) marine mammal sightings included two sperm whales, one Bryde's whale, various dolphin species and a number of unknown whale and dolphin species. During the same survey there were five observations of olive ridley sea turtles (Vulnerable) and three observations of unidentified sea turtles.

No local artisanal fishing from the Ayeyarwady Region is anticipated in the Project Area based on the fishing data collected from previous stakeholder consultation with the townships neighbouring A-6 (Pathein and Chaungthar) (4) in 2015 and 2016. Local fishermen stated that the majority of fishing is conducted either in rivers or out to about 7 miles (11 km) from the coast. Some larger commercial vessels from outside Ayeyarwady Region (i.e. other areas of Myanmar or international vessels) may fish in the Project Area. During the 2015–2016 drilling in A-6, there were no fishing interactions (i.e. observation of fishing vessels) in proximity to or within the 1,640 ft (500 m) exclusion zone) during the 52 day drilling period. During the 2016 3D marine seismic survey, there were 18 fishing vessel sightings and five fishing gear sightings recorded within and near A-6. As the nearest boundary of the Project Area is located about 21 miles (35 km) from the nearest coastline, interactions between local artisanal fishing vessels and the Project activities are considered highly unlikely. Consultation with local fishermen determined there could also be vessels from other areas of Myanmar (i.e. Tanintharyi Region, Mon State and Yangon) within the waters of A-6. These vessels will be the larger commercial trawlers / vessels. As such, the assessment of impacts on fishing will be limited to offshore fishing vessels which may be in the Project Area.

(3) Myanmar Ecosystem Survey (2015). FAO-NORAD Project No: GCP/INT/003/NOR. Cruise Report "Dr. Fridtjof Nansen". EAF – N/2015/

(4) During these consultations, the GAD informed Woodside that there is a new Township "Shwe Thaungyan", which used to sit inside Thabaung Township. Also within this new township is the sub-township "Chaungthar". Both the sub-township of Chaungthar and the new township of Shwe Thaungyan use to be included in Thabaung Township. Stakeholders were informed on the proposed Project and were provided an opportunity to voice concern, questions or opinions they may have on the Project.

The south-west corner of A-6 is located within a lightly used shipping route between the ports in the north (Kolkata, Chittagong etc.) heading to the southern tip of India and the Straits of Malacca in the south.

1.5 IMPACT ASSESSMENT AND PROPOSED MITIGATION

The EIA has assessed the potential impacts and proposed mitigation to reduce the level of the impact. The EIA concluded that potential impacts are typically short term and are well understood, with little or no evidence of adverse consequences on the majority of environmental or social receptors from previous experience in the industry. These potential impacts and the associated mitigation measures are summarised in *Table 1.2*.

Table 1.2 Key Potential Impacts and Proposed Mitigation Measures

Potential Impact/Issue	Control / Mitigation Measures	Significance of Residual Impact
Impacts from drill cuttings and drilling fluid discharges to sediment quality, benthic communities, water quality, fish and pelagic communities	• WBDF shall be used as the first preference and where WBDF cannot meet required specifications NADF may be used following technical justification. • The average oil content for discharge of NADF pit cleaning slops will be limited to less than 1% by volume. • Average oil on cuttings for the wells will be limited to 6.9% or less by weight. • Residual NADF will be disposed of downhole, or returned to shore for reconditioning, re-use or disposal • No bulk discharge of NADF drilling fluids will be permitted offshore. • Where cuttings are discharged overboard, they will be discharged below the water line. • NADF system set up via the Woodside NADF Start-up Checklist. • All chemicals that may be discharged to the marine environment during the exploration drilling activity will be selected and approved as per the Woodside Chemical Assessment Process. • All Woodside approved chemicals are included on the Chemical Selection List, which is regularly reviewed. • Bulk operational discharges conducted under the MODU's permit to work (PTW) system (to operate discharge valves/pumps).	**Negligible** (sediment quality, benthic communities, fish and pelagic species) **Minor** (water quality)
Impacts from underwater sound on marine fauna	• 0.6 miles (1 km) visual observation zone. • Pre-start observations and soft start procedures. • Visual observations of the observation zone (0.6 miles; 1 km) must be maintained continuously for whales or turtles. • 1640 ft (500 m) precautionary shut-down zone. • Night-time / low visibility procedures. • Pre-start meeting with crew to include marine fauna observations and reporting requirements. • During periods of low visibility, vertical seismic profiling (VSP) may be used as described in soft start and operating procedures provided that there have not been three or more whale shut down situations during the preceding 24 hours or if operations were not underway during preceding 24 hours, no whales were sighted in two hour period during preceding 24 hours. • A trained crew member will be utilised during VSP operations to monitor and record marine fauna.	**Minor** (fish) **Moderate** (marine mammals and turtles) but considered As Low As Reasonably Practicable (ALARP)*

Potential Impact/Issue	Control / Mitigation Measures	Significance of Residual Impact
Impacts on fishing activity and shipping from physical presence of MODU and vessels	• A 1640 ft (500 m) radius safety exclusion zone will be maintained around the MODU as required. • MODU and support vessels will comply with international regulations for collision avoidance, navigation and maintenance. • Myanmar speaking crew members available on board the MODU.	**Negligible** (fishing and shipping)
Impacts from unplanned collisions on fishing vessels and other marine users	• Implement the stakeholder engagement plan (SEP) to ensure timely sharing of information on the details of the proposed drilling program in order to inform stakeholders. • Issue Notice to Mariners. • Disclosure and implementation of the Grievance Mechanism for the Project and timely investigation of any grievances.	**Negligible** (fishing, shipping and livelihoods)
Impacts from greenhouse gas (GHG) emissions from the MODU, support vessels, machinery engines and flaring	• The well test duration will be minimised to the extent possible. • Energy efficient design and operation of machinery. • Engine maintenance to minimise unburned hydrocarbons. • The MODU and support vessels will have International Air Pollution Prevention (IAPP) certificates (as applicable or required by vessel class). • Vessels (as applicable or required by vessel class) will have a Ship Energy Efficiency Management Plan (SEEMP). • Use of low Sulphur fuel (sulphur content not to exceed 3.5% m/m) when it is available.	**Negligible** (atmosphere and climate)
Impacts from unplanned spills on marine fauna and habitats	• Vessel standard operating procedures and bunkering procedures (including limiting commencement of bunkering to daylight hours, visual monitoring, and dry break couplings). • MODU and support vessels (as applicable or required by vessel class) operate in compliance with MARPOL. • Vessels will hold a valid International Oil Pollution Prevention (IOPP) certificate, maintain an oil record book, and have a Shipboard Oil Pollution Emergency Plan (SOPEP) on board. • Vessels will hold the Oil Pollution Emergency Plan (OPEP) on board to implement in a spill incident requiring capability beyond the SOPEP • Chemicals and/or hydrocarbons handled and stored in accordance with Safety Data Sheets (SDS). • Appropriate waste segregation and disposal. • Spill response kits on board vessels and the MODU. • Standard maritime safety/navigation procedures.	**Negligible** (marine fauna, seabirds, fish)

* Note that although the residual impact significance is the impact itself, with the proposed existing controls in place, it is considered to be reduced to a level that is ALARP. As such, it is considered that the moderate impacts are being managed effectively and efficiently.

This Project consists only of an operations phase. There are no construction or decommissioning related phases. At the end of Project activities, the MODU and all Project vessels will depart the Project Area. As such, this impact assessment is conducted for the operations phase only.

Section 6 of this Report identifies the impacts that have been scoped out of the assessment and are therefore not included as the "key" potential impacts in the above table. The rationale for scoping out these impacts is provided in *Table 6.2*. The scoped out impacts include:

- Impacts from air emissions from MODU, support vessel(s), machinery engines and on ambient air quality
- Impact from lighting on MODU on marine fish, turtles and seabirds
- Impacts from routine MODU and vessel discharges on marine environment

- Impacts from underwater sound generated by the MODU and support vessels
- Impacts from standard waste generation and disposal
- Impacts from accidental loss of solid hazardous or non-hazardous wastes to the marine environment (excludes sewerage, grey water, putrescible waste and bilge water)
- Introduction of invasive marine species associated with ballast water transfer and transportation of invasive marine species via MODU/ vessel hulls, internal niches or in-water equipment
- Impacts from dropped objects on marine habitats
- Impacts from unplanned venting of gas during drilling (well kick)
- Impacts from well blowout
- Impacts from marine fauna from vessel collision
- Impacts from hydrogen sulphide (H_2S) emissions
- Impacts to coastal environmental and social receptors (tourism).

1.6 STAKEHOLDER ENGAGEMENT

Consultations were conducted for the Project in June 2016 in Chaungthar and Pathein. Consultation was also undertaken for exploration activities in the same block in Thabaung and Pathein in 2015 to identify potentially affected stakeholders.

Representatives from Shwe Thaungyan Township, Chaungthar Sub-Township and Thabaung Township were invited to participate in a Community Town Hall held in Chaungthar in June 2016. Given the offshore location of the Project Area and the potential spatial extent of the impacts, it is unlikely that local communities from the adjacent coastline will be impacted. As a consequence, local consultation focused on fishermen and their representatives.

These consultations confirmed that the local communities are unlikely to be fishing in the area in which the wells will be drilled and therefore it is unlikely that there will be an overlap between Project activities and local fishing activities. Project consultation was conducted in June 2016 as it was identified as the last opportunity during the EIA Study period to access relevant areas due to the bad weather and heavy rainfall of the monsoon period (June to September). The date, location, stakeholder and purpose of each meeting are provided in *Table 1.3*.

Table 1.3 Consultation Activities Undertaken during Scoping and Other Relevant Consultation

Date & Location	Stakeholder	Purpose
2015 – For Seismic Survey and Exploration Drilling undertaken in late 2015 / early 2016		
18 March 2015, Pathein	General Administrative Department (GAD), Ayeyarwady Regional Government (eight Government representatives, including the Chief Minister, of the Ayeyarwady Region)	• Project disclosure • Attain comments and suggestions from Regional Government authorities

Date & Location	Stakeholder	Purpose
28 March 2015, Thabaung Town	Thabaung Township Representatives – Township Administrator, Government representatives, local fisher representatives	• Project disclosure • Answer questions • Provide stakeholders with project contacts
30 April 2015, Pathein	Myanmar Fisheries Federation (MFF) – Ayeyarwady Region	• Project disclosure • Request for information – fishing activities specific to the Ayeyarwady Region
25 May 2015, Yangon	Myanmar Centre for Responsible Business	• Follow-up meeting on progress of Marine seismic survey and exploration drilling consultation activities
28 May 2015, Yangon	Fauna and Flora International	• Project disclosure • Request for information
28 May 2015, Yangon	Wildlife Conservation Society	• Project disclosure • Request for information
29 May 2015, Yangon	Istituto Oikos	• Project disclosure • Request for information
10 June 2016, Yangon	Myanmar Centre for Responsible Business	• Follow-up meeting on progress of Marine seismic survey and exploration drilling consultation activities
24 June 2015, Naypyidaw	Department of Fisheries (DoF)	• Project disclosure • Request for information
2016 – For current Project		
10 June, 2016, MCRB Office	Myanmar Centre for Responsible Business (MCRB)	• Disclose information on the Project. • Request for information.
13 June 2016, Pathein	DoF	• Project disclosure • Request for information
14 June 2016, Chaungthar	Township meeting including representatives from Shwe Thaungyan, and sub township – Chaungthar *	• Project disclosure • Request for information

Date & Location	Stakeholder	Purpose
14 June, 2016, Pathein	Ministerial meeting at the offices of the Chief Minister of Ayeyarwady Region (including Minister of Electric Power, Energy, Industry and transportation, Assistant Director of ECD, Regional Secretary of Pathein GAD and Director of DoF)	• Project disclosure • Request for information • Attain comments and suggestions from Regional Government authorities
16 June 2016, Yangon	MFF	• Project disclosure • Request for information
16 June 2016, Yangon	DoF	• Project disclosure • Request for information
26 October 2016, phone call	Department of Tourism in Chaungthar and Ngwe Saung	• Request for information

* There are two townships neighbouring A-6: Pathein and Thabaung. During consultations in 2016, the GAD informed Woodside that there is a new Township “Shwe Thaungyan”, which used to be included in Thabaung Township. Within this new Township, there is also a new Sub-Township designation around “Chaungthar”. It was recommended that consultation be undertaken in Chaungthar.

The meetings were undertaken to disclose information on the Project at the regional and national level and to confirm the baseline understanding of the Project Area. A summary of the outcomes of the meetings is presented below:

- A meeting was conducted with stakeholder in Chaungthar in a "townhall" style. This meeting was attended by local GAD, local fishermen from neighbouring villages of Chaungthar, Tha Bock Kan, Wout Thay, Shwe Thaung Yan, Khan Gyi, and Aung Min Glar Kyun as well as local community based organisations (such as the Myanmar Women's Association).
- During the townhall meeting it was confirmed that local fishermen generally fish within the “inshore” fishing area i.e. within 10 nautical miles (nm) (11.5 miles, 18.5 km) of the coast or in rivers in the Delta area. Some large, purse seine fishing vessels (over 90 ft in length) are known to fish up to 30 miles (48 km) from the coastline.
- There could also be vessels from other areas of Myanmar (i.e. Tanintharyi Region, Mon State and Yangon) within the waters of A-6. These vessels will be the larger commercial trawlers / vessels.
- The questions raised included the impact of chemical use on marine mammals and the management of hazardous and non-hazardous wastes.
- No other potential impacts to coastal activities were identified and in general, the local community was supportive of the Project as long as there were no impacts to coastal communities.

1.7 CONCLUSIONS AND RECOMMENDATIONS

Project stakeholder consultation confirmed that there is limited local level fishing activity in locations greater than 21 miles (35 km) from the coastline (i.e., within the Project area). Given this it is unlikely that local artisanal fishermen will be impacted by the Project activities. This was confirmed during the consultation in Ayeyarwady Region by representatives from local fishing communities.

Stakeholder engagement is understood to be a continuous process to be undertaken throughout the life of the Project.

Consultation, primarily targeted at offshore fisher groups, will continue up to, and throughout, the proposed drilling program. Although impacts on local communities and other coastal activities are considered unlikely, ongoing project information will also be provided in local areas. In addition, a grievance mechanism will be made available to stakeholders during the implementation of the drilling activities.

Following the submission of the EIA, the EIA report will be publically disclosed. This process will include making the executive summary of the EIA Report available by distributing it to the GAD and DoF offices in Pathein and the MFF office in Yangon. The availability of the EIA Report will also be advertised in two newspapers - The Mirror and The New Light of Myanmar - and on local radio.

Woodside will further iterate the SEP throughout these phases to appropriately manage ongoing engagement and respond to stakeholder concerns that may arise in relation to the implementation of the Project.

As no sensitive environmental receptors are represented within the Project Area, and any potential impacts will be transient and short-lived in nature, environmental baseline surveys are not considered necessary. Data has been collected to date from primary (previous consultation in Ayeyarwady) and secondary (research papers, and other data sources) sources. Given the nature and scale of the Project, there are no substantial gaps in current knowledge that would affect the robustness of the impact assessment that will be undertaken and presented in the EIA Report.

The EIA Study for the proposed drilling program in A-6 was conducted to comply with the requirements of the EIA Procedure. The EIA demonstrates that the JV understands the environment and social setting in which they are operating and has properly assessed the key potential environmental and social impacts associated with the Project.

A project-specific, dedicated EMP has been developed separately to this EIA Report and presented as a tool to manage impacts associated with the Project and ensure legislative compliance and standards of good practice during the proposed drilling program in A-6. Provided that the recommended mitigation measures are properly implemented, it is expected that the environmental and social impacts of the Project would be managed in a professional and acceptable manner. As such, the EIA concludes that no Major impacts on the environment and people are anticipated from this Project and all impacts have been properly mitigated to be ALARP.

1 အစီရင်ခံစာ အကျဉ်းချုပ်

1.1 နိဒါန်း

ဤစာတမ်းသည် ပြည်ထောင်စုသမတ္တမြန်မာနိုင်ငံတော် (မြန်မာနိုင်ငံ)၊ ရခိုင်ချိုင့်ဝှမ်း၊ လုပ်ကွက်အမှတ် A-6 (A-6) ရှိ အဆိုပြုထားသည့် တူးဖော်ခြင်းဆိုင်ရာအစီအစဉ် အတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အစီရင်ခံစာ ဖြစ်ပါသည် (စီမံကိန်း)။ ဤ EIA အစီရင်ခံစာကို (၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက် ရက်စွဲပါ၊ အမိန့်ကြော်ငြာစာ အမှတ်၊ ၆၁၆/၂၀၁၅) မြန်မာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (EIA လုပ်ထုံးလုပ်နည်း) ၂၀၁၅ နှင့် အညီ သယံဇာတနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) မှ အတည်ပြုချက်ရယူရန် ပြင်ဆင်ရေးသားထားခြင်းဖြစ်ပါသည်။

EIA လုပ်ထုံးလုပ်နည်းအရ၊ ဤစီမံကိန်းသည် EIA အစီရင်ခံစာ နှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) ကို ပြင်ဆင်ရေးသားပြီး၊ MONREC သို့ တင်သွင်းရန် လိုအပ်ပါသည်။

လုပ်ကွက်အမှတ် A-6 အကျိုးတူဖက်စပ်လုပ်ငန်း (JV၊ *ဇယား ၁.၁*) ကိုယ်စား Woodside Energy (Myanmar) Pte Ltd (Woodside) က A-6 ရှိ ၂၀၁၇ ခုနှစ် (*ပုံ ၁.၁*) တွင် စတင်ဆောင်ရွက်မည့် တူးဖော်ရေးအစီအစဉ် ကို အဆိုပြုပါသည်။ ဤစီမံကိန်း အဆိုပြုတူးဖော်ရေးအစီအစဉ်တွင် ၂၀၁၇ -၂၀၁၉ အချိန်ကာလအတွင်း တူးဖော်ရေးတွင်း ခြောက်တွင်းအထိပါဝင်ပါသည်။ သို့ရာတွင် ၎င်းတွင်းအားလုံးကို တူးဖော်ရန် သေချာသည် မဟုတ်ပါ။

၂၀၁၇ ခုနှစ်တွင် တူးဖော်ရန် နှစ်တွင်း ပါဝင်ပါသည်။ ၎င်းနှစ်တွင်းအနက် တစ်တွင်းတူးဖော်ရန်မှာ သေချာပြီး၊ ကျန်နောက်တစ်တွင်း တူးဖော်ရန်မှာ ရွေးချယ်ဆုံးဖြတ်ရဦးမည်[1] ဖြစ်ပါသည်။ ၂၀၁၇ ခုနှစ် တူးဖော်ခြင်းများ၏ ရလဒ်အပေါ်မူတည်၍ နောက်ထပ် လေးတွင်းကို ၂၀၁၈ နှင့် ၂၀၁၉ ခုနှစ်တို့တွင် A-6 JV ဆုံးဖြတ်ချက်အရ သာလျှင် တူးဖော်လိမ့်မည်ဖြစ်ပါသည်။

ရခိုင်ချိုင့်ဝှမ်းရှိ A-6 နှင့်စပ်လျဉ်း၍ Woodside သည် MPRL E&P Pte Ltd (MPRL E&P) နှင့် ၂၀၁၃ ခုနှစ်တွင် လုပ်ငန်းစာချုပ် ချုပ်ဆိုခဲ့ပါသည်။ ၂၀၁၅ ခုနှစ်တွင် Total E&P Myanmar (Total E&P) က A-6 တွင် ပါဝင်လာပါသည်။ Woodside 40%၊ Total E&P ၄၀% နှင့် MPRL E&P ၂၀% အသီးသီးပါဝင်ကြပါသည် (JV)။ Woodside သည် ပူးပေါင်းပါဝင်သည့် အော်ပရေတာ ဖြစ်ပါသည်။

EIA လုပ်ထုံးလုပ်နည်းနှင့်အညီ၊ စီမံကိန်း၏ ပထမအဆင့်တွင် စိစစ်ခြင်းပါဝင်ပြီး၊ စီမံကိန်းအဆိုပြုလွှာအစီရင်ခံစာ (PPR) ကို မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း (MOGE) သို့ တင်သွင်းခြင်းတို့ပါဝင်သည် (ထိုမှတစ်ဆင့် MONREC သို့ တင်သွင်းရခြင်းဖြစ်ပါသည်)။ PPR ကို ၂၀၁၆ ခုနှစ် ဖွန်လတွင် ပြင်ဆင်ရေးသားတင်သွင်း ခဲ့ပါသည်။ MONREC ၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD) မှ သုံးသပ်ပြီးနောက် ၂၀၁၆ ခုနှစ် ဩဂုတ်လ တွင်၊ Woodside သို့ အဆိုပြုတူးဖော်ရေးဆိုင်ရာလုပ်ငန်းများအတွက် EIA ကို ဆောင်ရွက်ရန် ညွှန်ကြားလျက် PPR ကို ပြန်ကြားခဲ့ပါသည်။ ၎င်းနောက် Woodside က EIA လေ့လာမှုအတွက် ဆောင်ရွက် ရမည့် လုပ်ငန်းတာဝန်များ ပါဝင်သည့် နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းအစီရင်ခံစာ ကို ပြင်ဆင် တင်သွင်းခဲ့ပါသည်။ ၎င်းကို ၂၀၁၆ ခုနှစ် စက်တင်ဘာလ ၇ ရက်နေ့တွင် MOGE သို့ တင်သွင်းခဲ့ပါသည်။

JV ကိုယ်စား၊ Woodside သည် စီမံကိန်းအတွက် EIA လေ့လာမှု ကို ပြုလုပ်ဆောင်ရွက်ရန် Environmental Resources Management (ERM) ကို တာဝန်ပေးအပ်ခဲ့ပါသည်။ ERM သည် ဒေသခံမြန်မာ ကျွမ်းကျင်မှုများကို

(1) အနာဂတ်တွင် JV မှ ဆောင်ရွက်ရန် ဆုံးဖြတ်ပြီးမှ ဆက်လက်တူးဖော်မည့် လုပ်ငန်းဖြစ်ပါသည်။

ရယူရန် အမျိုးသားပတ်ဝန်းကျင် အကြံပေးလုပ်ငန်း E Guard Environmental Services Co. Ltd (E Guard) နှင့် ချိတ်ဆက်ဆောင်ရွက်ခဲ့ပါသည်။

ဤစာတမ်းသည် A-6 ရှိ စီမံကိန်းလုပ်ငန်းအတွက် EIA အစီရင်ခံစာ ဖြစ်ပါသည်။ MONREC သို့တင်သွင်းရန်နှင့် အတည်ပြုချက်ရယူရန် ဤအစီရင်ခံစာနှင့်အတူ သီးခြား EMP ကိုလည်း ပြင်ဆင်ရေးသားလျက်ရှိပြီးပါသည်။

စီမံကိန်းအသေးစိတ်အချက်အလက်များကို *ဇယား ၁.၁* တွင် အကျဉ်းချုပ်တင်ပြပေးထားပါသည်။

ဇယား ၁.၁ အဆိုပြု စီမံကိန်းအသေးစိတ်အချက်အလက်များအကျဉ်းချုပ်

	အသေးစိတ်အချက်အလက်များ
လုပ်ကွက်အမှတ်	A-6၊ *ပုံ ၁.၁* အရ မြန်မာကမ်းလွန်
အကျိုးတူဖက်စပ်လုပ်ငန်းတွင် ပါဝင်သူများ	Woodside – ၄၀ % (အကျိုးတူပူးပေါင်းသည့်အော်ပရေတာ နှင့် စီမံကိန်း၏ အော်ပရေတာ) Total E&P – ၄၀% (စီမံကိန်း၏ အော်ပရေတာမဟုတ်ပါ) MPRL E&P – ၂၀% (စီမံကိန်း၏ အော်ပရေတာမဟုတ်ပါ)
စီမံကိန်း ဇရိယာ နှင့် ကမ်းရိုးတမ်း မှ အကွာအဝေး	A-6 စီမံကိန်းဇရိယာသည် မြန်မာကမ်းရိုးတမ်းမှ အနီးဆုံးအမှတ်မှာ ၂၁ မိုင် (၃၅ ကီလိုမီတာ) ခန့် ကွာဝေးသည် (A-6 အနားသတ် ၂၁ မိုင် ပြီးမှ "စီမံကိန်းဇရိယာ" ဟုသတ်မှတ်သည်)
A-6 တွင် ယခင်က လုပ်ငန်းများ နှင့် လုပ်ငန်းအတွက် အော်ပရိတ်တာ	နှစ်ဘက်မြင် (2D) အကျော်ဝါဆိုက်စမစ် တိုင်းတာရေးကို ၂၀၁၉ ခုနှစ်တွင်ဆောင်ရွက်ခဲ့သည် (MPRL E&P) သုံးဘက်မြင် (3D) အကျော်ဝါဆိုက်စမစ် တိုင်းတာရေးကို ၂၀၁၀ ပြည့်နှစ်တွင် ဆောင်ရွက်ခဲ့သည် (MPRL E&P) ပြည်သာ-၁ (Pyi Thar-1) တွင်းကို ၂၀၁၂ ခုနှစ်တွင် တူးဖော်ခဲ့သည် (MPRL E&P) Pyi Thar-1ST တွင်းကို ၂၀၁၂ ခုနှစ်တွင် တူးဖော်ခဲ့သည် (MPRL E&P) 3D အကျော်ဝါဆိုက်စမ်စတိုင်းတာရေးကို ၂၀၁၃ ခုနှစ်တွင် ဆောင်ရွက်ခဲ့သည် (Woodside) 3D ဆိုက်စမစ်တိုင်းတာရေးကို ၂၀၁၆ ခုနှစ်တွင် ဆောင်ရွက်ခဲ့သည် (Woodside) ရွှေရီထွန်း-၁ (Shwe Yee Htun-1) တွင်းကို ၂၀၁၆ ခုနှစ်တွင် တူးဖော်ခဲ့သည် (Woodside)
အတည်ပြုချက်ရယူမည့် အဆိုပြု ရှာဖွေရေးလုပ်ငန်းများ၏ နယ်ပယ်အတိုင်းအတာ	၂၀၁၇ ခုနှစ် - တူးဖော်ရေးတွင်း နှစ်တွင်း၊ တစ်တွင်းတူးရန်မှာသေပြီး၊ နောက်တစ်တွင်း ရွေးချယ်ဆုံးဖြတ်ရဦးမည် ဖြစ်သည်။ ၂၀၁၈/၁၉ ခုနှစ် - တူးဖော်ရေးတွင်း လေးတွင်းတူးဖော်ရန် အလားအလာရှိသည်။ ၂၀၁၇ ခုနှစ် တူးဖော်ရေးရလဒ်များအပေါ် မူတည်၍။ အကျိုးတူဖက်စပ်လုပ်ငန်းမှ တူးဖော်မည်၊မတူးဖော်မည် ကို မဆုံးဖြတ်ရသေးပါ။
အဆိုပြုလုပ်ငန်းအတွက် အကြံပေးအဖွဲ့များ	ERM နှင့် E Guard

1.2 မူဝါဒနှင့် စည်းမျဉ်းဖွဲ့စည်းမှုမဘောင်

ပြည်ထောင်စုသမတ္တမြန်မာနိုင်ငံ၏ *ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ* နှင့် *ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ* အရ၊ Woodside သည် စီမံကိန်းအတွက် EIA လေ့လာမှုကို ဆောင်ရွက်ရန် နှင့် အဆိုပြုရှာဖွေရေး လုပ်ငန်းများအတွက် MONREC မှ EIA အစီရင်ခံစာအတည်ပြုချက်ရယူရန် လိုအပ်ပါသည်။

စီမံကိန်းကို အမျိုးသားနှင့် ဒေသခံအဆင့် စံချိန်စံညွှန်းများနှင့် ဥပဒေများနှင့်အညီ ဆောင်ရွက်မည် ဖြစ်ပါသည်။ EIA နှင့်စပ်လျဉ်းသည့် ဒေသခံအဆင့် ဥပဒေများတွင် -

- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)၊
- ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးနည်းဥပဒေ (၂၀၁၄)၊
- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှင့်မှု) လမ်းညွှန်ချက် များ (၂၀၁၅) (NEQ လမ်းညွှန်ချက်များ)
- EIA လုပ်ထုံးလုပ်နည်း (၂၀၁၅) တို့ပါဝင်ကြပါသည်။

ဥပဒေစာရင်း အပြည့်အစုံနှင့် ၎င်းတို့၏ စီမံကိန်းနှင့်သင့်လျော်မှုကို *ပုဒ်မ ၃* တွင်ဖော်ပြထားပါသည်။

(၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက်နေ့တွင်) အပြီးသတ် EIA လုပ်ထုံးလုပ်နည်းထွက်ပေါ်လာပြီးနောက်၊ NEQ လမ်းညွှန်ချက်များလည်းထွက်ပေါ်လာခဲ့ပါသည်။ ဤလမ်းညွှန်ချက်များသည် အများပြည်သူကျန်းမာရေးနှင့် ပတ်ဝန်းကျင်ကို ကာကွယ်ရန်နှင့် ညစ်ညမ်းမှုကို တားဆီးနိုင်ရန် စီမံကိန်းမှ ဆူညံမှုနှင့် လေထုတ်လွှင့်မှုများ နှင့် အညစ်အကြေးထုတ်လွှတ်မှုများကို ထိန်းချုပ်ရေးနှင့် စည်းမျဉ်းစည်းကမ်းများအတွက် အခြေခံအချက်အလက်များကို အထောက်အပံ့ပြုပါသည်။ ဤစံချိန်စံနှုန်းများသည် International Finance Corporation (IFC) အထွေထွေ EHS လမ်းညွှန်ချက်များ (၂၀၁၇) [(1)] မှ အကြံပြုထားသော စံချိန်စံနှုန်းများအပေါ်အတွင် အခြေပြုထားခြင်းဖြစ်သည်ဟု မှတ်ယူပါသည်။

1.3 စီမံကိန်းဖော်ပြချက်နှင့် အခြားဆောင်ရွက်နိုင်သော နည်းလမ်းများ

A-6 သည် မြန်မာပင်လယ်ကမ်းလွန်တွင် တည်ရှိပါသည်။ A-6 စီမံကိန်းဧရိယာသည် မြန်မာကမ်းရိုးတမ်းမှ အနီးဆုံးအမှတ်မှာ ၂၁ မိုင် (၃၅ ကီလိုမီတာ (km)) ခန့် ကွာဝေးပါသည်။ A-6 တွင် ရေ အနက် ၃၂ ပေ (၁၀ မီတာ (m)) မှ ၇၈၇၀ ပေ (၂၄၀၀ မီတာ) ခန့် အထိအသီးသီး ရှိကြသည့် ကမ်းဦးရေတိမ်ပိုင်း၊ ကမ်းနီးဘက်မှ ရေနက်ပိုင်း၊ ရေနက်ပိုင်းတို့ပါဝင်သော ကမ်းလွန်ရေပြင် တလျောက်ကုန်းစောင်းပိုင်းနှင့် အလွန်နက်သည့်ချောက်လွင်ပြင်များ ပေါင်းစပ်ပါဝင် ပါသည်။

Woodside သည် ၂၀၁၇ ခုနှစ်တွင် တူးဖော်ရေးတွင်းနှစ်တွင်းတူးရန် အဆိုပြုပါသည်။ ၎င်း နှစ်တွင်းအနက် တစ်တွင်းမှာ တူးဖော်ရန် သေချာပြီး၊ ၎င်းနှစ်တွင်းအနက် ကျန်နောက်တစ်တွင်း တူးဖော်ရန်မှာ ရွေးချယ်ဆုံးဖြတ်ရဦးမည် ဖြစ်ပါသည်။ ၂၀၁၇ ခုနှစ်အတွက် အဆိုပြု တူးဖော်ခြင်းများ၏ ရလဒ်အပေါ်မူတည်၍ နောက်ထပ် လေးတွင်းကို ၂၀၁၈ နှင့် ၂၀၁၉ ခုနှစ်တို့တွင် JV ၏ ဆုံးဖြတ်ချက်အရ သာလျှင်

(3) ပတ်ဝန်းကျင်၊ ကျန်းမာရေးနှင့် အန္တရာယ်ကင်းရှင်းရေး (EHS) လမ်းညွှန်ချက်များ - အထွေထွေ EHS လမ်းညွှန်ချက်များ။ ၂၀၁၇ ခုနှစ် ဇူလိုင်၊ International Finance Corporation၊ ကမ္ဘာ့ဘဏ်အုပ်စု

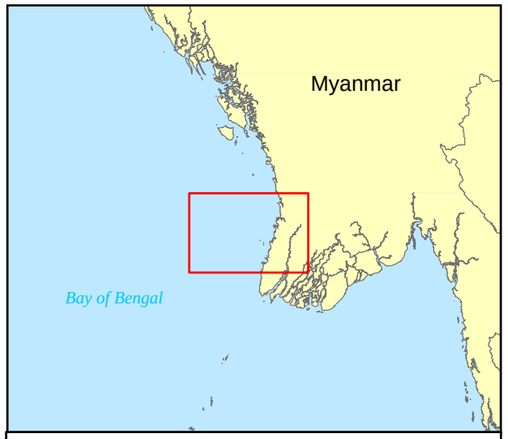
တူးဖော်လိမ့်မည်ဖြစ်ပါသည်။ တူးဖော်ရေးတွင်းအားလုံးကို ပုံ ၁.၁ တွင် ပြထားသည့်အတိုင်း စီမံကိန်းလုပ်ငန်းဧရိယာအတွင်း (ဥပမာ - ကမ်းရိုးတမ်းမှ ၂၁ မိုင် (၃၅ ကီလိုမီတာ) ခန့်အကွာတွင်) တူးဖော်ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။ သို့ရာတွင် တူးဖော်ရေးတွင်းများ၏ တည်နေရာအသေးစိတ်များကို အပြီးသတ်ရေးဆွဲချမှတ်ခြင်းများ မပြုလုပ်ရသေးပါ။

တွင်းများတူးဖော်ရာတွင် ရွှေ့ပြောင်းနိုင်သောရေနံတွင်းတူးစင် (MODU) ကို အသုံးပြုမည် ဖြစ်ပြီး၊ ၎င်းကို ရေယာဉ်သုံးစီး သို့မဟုတ် လေးစီးဖြင့် အထောက်အကူပြုထားဖြစ်ပါသည်။ တူးဖော်ရန် စံသတ်မှတ်ထား သည့် တွင်းတစ်တွင်း သည် စုစုပေါင်းအနက် ၆၅၆၀ ပေ (၂၀၀၀ မီတာ) မှ ၈၂၀၂ ပေ (၂၅၀၀ မီတာ) (ရေအောက် ကြမ်းပြင် အောက် ဒေါင်လိုက်အနက်ကို မီတာဖြင့်ပြထားပါသည်) ထိရှိမည် ဖြစ်သည်။ ကမ်းလွန်ရေနံအစမ်း တွင်း တူးဖော်ခြင်း တွင် သေးငယ်သည့်တွင်း တစ်တွင်း တူးဖော်ရန် ရွှေ့လျားရေနံတွင်းတူးစင် MODU မှ ပင်လယ် ကြမ်းပြင် အောက်သို့ တွင်းတူးလွန်သွားတစ်ခု အား ပို့လွှတ်ခြင်း ပါဝင်သည်။ တွင်းတစ်တွင်း၏ အနက်သည် ရေအောက်ကြမ်းပြင်ရှိ အလားအလာ ရှိသည့် ရေနံ သို့မဟုတ် သဘာဝဓါတ်ငွေ့ကို ပစ်မှတ်ထားရန် ဖြစ်သည်။ ရေနံတွင်းတူးဖော်ရာတွင် ရေအခြေခံသည့်တွင်းတူးရည် (WBDF)နှင့် ရေကိုအခြေမခံသည့်တွင်းတူးရည် (NADF) တို့အား အသုံးပြု သွားမည်ဖြစ်ပါသည်။ WBDF နှင့် ရှိုဖြတ်စ (Drill Cutting) များကို ပင်လယ်ကြမ်းပြင် ပေါ်တွင် စွန့်ထုတ်သွားမည် ဖြစ်ပါသည်။ NADF ပါဝင်သော ရှိုဖြတ်စများကိုမူ ရေနံတူးစင်ပေါ်သို့ သယ်ယူပြီး ပြင်ပသို့ မစွန့်ထုတ်မီ ဆီပါဝင်မှုလျော့ကျစေရန် စီရင်ဆောင်ရွက်စေမည် ဖြစ်ပါသည်။

အဆိုပြုစီမံကိန်းဒီဇိုင်းအဆင့်၏ တစ်စိတ်တစ်ဒေသအနေဖြင့်၊ 'စီမံကိန်းကိုဆက်လက်မလုပ်ဆောင်တော့ခြင်း' ကို မတူညီသော ရေနံ တွင်းတူးရည်များ၊ စွန့်ပစ်ခြင်းနည်းလမ်း များ၊ ရေနံတွင်းတည်နေရာနှင့် တူးဖော်ခြင်း ဆိုင်ရာ ရေယာဉ်အမျိုးအစားများကို စီမံကိန်းဆိုင်ရာ ကိစ္စရပ်များ အတွက် ဖြစ်နိုင်ချေရှိသော အခြားဆောင်ရွက်နိုင် သော နည်းလမ်းများဖြင့် ထည့်သွင်းစဉ်းစားဆောင်ရွက်ခဲ့ပါသည်။ စီမံကိန်းအား ဆက်လက်လုပ်ဆောင် မသွားနိုင် မည့် အခြေအနေများကို ထည့်သွင်းစဉ်းစားခဲ့သော်လည်း၊ အနာဂတ်တစ်ချိန်ချိန်တွင် ဈေးကွက်ဝင် သဘာဝ ဓါတ်ငွေ့ကိုရှာဖွေတွေ့ရှိလျှင်၊ မြန်မာနိုင်ငံ အကျိုးစီးပွား ဖြစ်ထွန်းစေနိုင်ပါသည်။ လုံခြုံရေးနှင့် နည်းပညာ ဆိုင်ရာ လိုအပ်ချက်များသည် WBDF တစ်ခုလုံး နှင့် ဆန့်ကျင်လျှက် NADF အတွက် လိုအပ်ချက်များကို အဆုံး အဖြတ် ပေးသည်။ ရှိုဖြတ်စများအတွက် စွန့်ထုတ်ရေးအခြားနည်းလမ်းများ (ရှိုဖြစ်စများကိုပြည်လည် ဖြည့် သွင်းခြင်း၊ ကုန်းပေါ်သို့သယ်ယူခြင်း သို့မဟုတ် အခြားရေနက်ပိုင်းစ်နေရာရှိ စွန့်ပစ်ရန်နေရာသို့သယ်ယူခြင်း) ကို နည်းပညာ ဆိုင်ရာ သို့မဟုတ် ငွေရေးကြေးရေးဆိုင်ရာ ဖြစ်နိုင်သော အခြားနည်းလမ်းများမဖြစ်စေရန် ဆန်းစစ်ပြီး ထည့်သွင်း စဉ်းစား ထားပါသည်။ ရေနံတွင်းတည်နေရာများကို တူးဖော်ရေးမစတင်မီ ရွေးချယ်ထားသော ပထဝီ အနေအထား နေရာများနှင့် တွင်းများတူးဖော်ရန် ခွင့်ပြုထားသည့် အသေးစိတ်တာဝန်များဖြင့် မောင်းနှင်မည်ဖြစ်ပါသည်။ ဤအခြေ အနေမျိုးတွင် အဆိုပြုတူးဖော်တွင်းတည်နေရာအတွက် အခြားဆောင်ရွက်နိုင်မည့် နည်းလမ်းများ ရှိနိုင်သည် မဟုတ်ပါ။ စီမံကိန်းဧရိယာသည် ဧရာဝတီတိုင်းဒေသကြီးရှိ ကမ်းရိုးတမ်း ပတ်ဝန်းကျင်နှင့် လူမှု ပတ်ဝန်းကျင် နေရာများမှ ၂၁ မိုင် (၃၅ ကီလိုမီတာ) ကျော်ကွာဝေးသည့် နေရာတွင် တည်ရှိနေပြီး၊ ယင်း ပတ်ဝန်းကျင် နေရာများအပေါ် သက်ရောက်မှု မရှိသလောက်သာ ဖြစ်ပေါ်မည် ဖြစ်ပါသည်။ စီမံကိန်းတွင် MODU ကို အသုံးပြုမည်ဖြစ်ပြီး၊ ၎င်းသည် စီမံကိန်းတွင် ရေအနက်နှင့် ပင်လယ်ရာသီဥတုနှင့်ဆိုင်သော (metocean) အခြေအနေများ၊ နည်းပညာဆိုင်ရာတူးဖော်ရေး နှင့် စီးပွားရေးဆိုင်ရာ ထည့်သွင်းစဉ်းစားချက်များ နှင့် တူးဖော်ရေး အချိန်ဇယားအတွက် ရရှိနိုင်ခြေများကို ပေါင်းစပ်မှုများအပေါ် အခြေခံလျှက် စီမံကိန်း၏ အကောင်းဆုံး ရရှိနိုင်သော စီမံကိန်းရွေးချယ်မှုနည်းလမ်း ဖြစ်ပါသည်။

1.4 အခြေခံအချက်အလက်အခြေအနေများ

လေ့လာမှုဧရိယာအတွက် အခြေခံအချက်အလက်များတွင် A-6 ကမ်းဝေးရေပြင်များ၊ ထိစပ်နေသော ပတ်ဝန်းကျင်များ နှင့် ရခိုင်ကမ်းရိုးတမ်းဒေသထိ (ဧရာဝတီတိုင်းဒေသကြီး၏ အနောက်ဘက်ကမ်းရိုးတမ်းနှင့် ရခိုင်ပြည်နယ် တောင်ဘက်ကမ်းရိုးတမ်းများပါဝင်သည် - ဥပမာ၊ *ပုံ ၁.၁* တွင်ပြထားသည်) ပါဝင်သည်။ အဆိုပြု စီမံကိန်း လုပ်ငန်းစဉ်များသည် A-6 (ပင်မမြေပြင်ကမ်းခြေမှ ၂၁ မိုင် (၃၅ ကီလိုမီတာ) ခန့်ကွာဝေးသည့်ဧရိယာ) စီမံကိန်း ဧရိယာ အတွင်းဆောင်ရွက်မည်ဖြစ်ပြီး၊ အများအားဖြင့် ရေအနက် ၇,၈၇၀ ပေ (၂,၄၀၀ မီတာ) နှင့် မြန်မာကမ်းရိုး တမ်း ဧရိယာမှ အနည်းဆုံး ၂၁ မိုင် (၃၅ ကီလိုမီတာ) အကွာအဝေးတွင် ဆောင်ရွက်မည်ဖြစ်သည်။ ထို့ကြောင့် အခြေခံ အချက်အလက်များသည် ကမ်းဝေး၊ ဟင်းလင်း သမုဒ္ဒရာ ပတ်ဝန်းကျင်များအပေါ် အလေးပေးထားပြီး ရေနက် နေရင်း ဒေသ သတ္တဝါများ နှင့် ဆက်စပ်နေခြင်း ဖြစ်ပါသည်။



ရည်ညွှန်းချက်

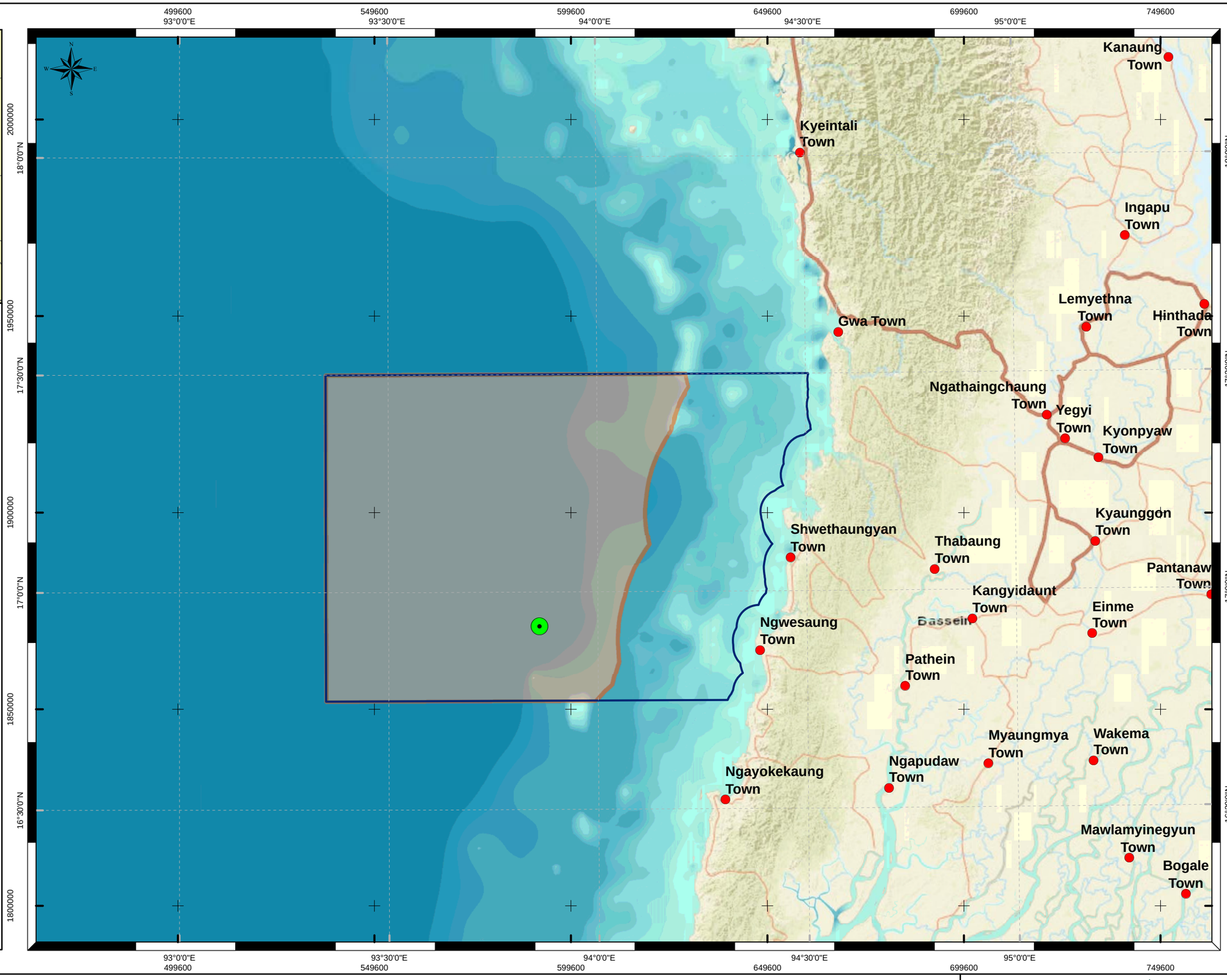
- လုပ်ကွက် A-6
- စီမံကိန်းဧရိယာ
- မှန်ယ
- Shwe Yee Htun-1

အနက်(မီတာ)

- > -10
- -10.1 - -20
- -20.1 - -30
- -30.1 - -40
- -40.1 - -50
- -50.1 - -60
- -60.1 - -70
- -70.1 - -80
- -80.1 - -90
- -90.1 - -100
- -100.1 - -500
- -500.1 - -1000
- -1000.1 - -1500
- -1500.1 - -2500
- < -2500

Kilometres

0 25 50



ဇယား ၁

A-6 တည်နေရာ

File: T:\GIS\CONTRACT\0360592\Mxd\0360592_Location_of_A6.mxd
Date: 30/9/2016

Environmental Resources Management

ERM

ရာသီဥတုအခြေအနေများကို မုတ်သုံရာသီ နှင့် အကူးအပြောင်းကာလများဖြင့် ဆုံးဖြတ်ပါသည်။ A-6 တွင် ကမ်းဦးရေတိမ်ပိုင်း၊ ကုန်းစောင်း နှင့် ရေတိမ်ပိုင်း တွင် အနက်ဆုံးသောတွင်းလွင်ပြင်၊ ကမ်းနီးမှရေနက်ပိုင်း နှင့် ကမ်းဝေးရေပြင် မှ သဘာဝ နေရင်းဒေသ သတ္တဝါများ ပါဝင်သည်။

ဇီဝဆိုင်ရာမျိုးစိတ်များတွင် ရေအောက်အနည်အနစ် နှင့် ပင်လယ်ကြမ်းပြင်ပေါ်တွင် နေထိုင်သော ကြီးမားသော ဒေသရင်းသတ္တဝါကြီးများ နှင့် ရေအောက်ရှိ ကျောရိုးမဲ့သတ္တဝါငယ်များပါဝင်သည်။ A-6 စီမံကိန်းဧရိယာတွင် ထိခိုက်လွယ်သော ပင်ရင်းနေဒေသများ သို့မဟုတ် ထိန်းသိမ်းရေးဧရိယာများမရှိပါ။

လေ့လာမည့် နယ်မြေဧရိယာ တွင် ရှိနေနိုင်သည့် ငါးမျိုးစိတ်များမှာ ကန်းရိုးတမ်း သို့မဟုတ် သွန်ကောက်တန်းနှင့် ဆက်နွယ်သော မျိုးစိတ်များ၊ ရေအောက်နှင့်ရေပြင်နေ ငါးမျိုးစိတ်များ နှင့် ပင်ရင်းနေဒေသအမျိုးအစားများလည်း ရှိနေနိုင်ပါသည်။ A-6 သည် စီးပွားဖြစ်အရေးပါသော ငါးမျိုးစိတ်များဖြစ်သည့် Clupeidae ခေါ် ငါးသလောက်များ နှင့် ငါးနီတူများ၊ Scombridae ခေါ် ငါးကွမ်းရုပ် နှင့် ငါးကျီးကန်း နှင့် demersal မျိုးစိတ်များဖြစ်ကြသည့် ငါးပါးနီ၊ ဆောင်လမွန်ငါး နှင့် ငါးပုတ်သင် စသည့် ရေပြင်တွင် ကျက်စားသည့် ပင်ရင်းနေဒေသတွင် တည်ရှိပါသည်။ ၂၀၁၅ ခုနှစ် [1]တွင် ပြုလုပ်ခဲ့သည့် စစ်တမ်းများနှင့် ၂၀၁၅ နှင့် ၂၀၁၆ ခုနှစ်အတွင်း ဧရာဝတီတိုင်းဒေသကြီး (ပုသိမ်၊ သာပေါင်း၊ ချောင်းသာ) တွင် အဆိုပြု စီမံကိန်း အတွက် ဒေသခံတံငါသည်များနှင့် ဆွေးနွေးတွေ့ဆုံပွဲများ မှ ကောက်ယူခဲ့သည့် အချက်အလက်များအရ၊ ဧရာဝတီရေပြင်ရှိတွေ့ရှိရသည့် အဓိက ငါးမျိုးစိတ်များသည် ယေဘုယျ အားဖြင့် သဘာဝထိန်းသိမ်းရေးအတွက် အပြည်ပြည်ဆိုင်ရာ အဖွဲ့အစည်း (IUCN)၏ ထိန်းသိမ်းရမည့် ငါးမျိုးစိတ်များအဖြစ် သတ်မှတ်ထားသည့် စရင်းတွင်ပါဝင်ခြင်း မရှိပါ။

ကမ္ဘာလုံးဆိုင်ရာ နှင့်/သို့မဟုတ် အမျိုးသားအဆင့် ထိန်းသိမ်းထားသည့် မျိုးစိတ်များဖြစ်သည့် အဏ္ဏဝါ နို့တိုက် သတ္တဝါ နှင့် လိပ်မျိုးစိတ်များသည် မြန်မာရေပြင်တွင် ကျက်စားကြကြောင်း လူသိများပါသည်။ အပြာရောင် ဝေလငါး (*Balaenoptera musculus*) (မျိုးတုန်းပျောက်ကွယ်ရန်စိုးရိမ်ရ)၊ ဆူးတောင်ပါဝေလငါး (*Balaenoptera physalus*) (မျိုးတုန်းပျောက်ကွယ်ရန်စိုးရိမ်ရ) နှင့် sperm whale ဖြစ်သည့် (*Physeter macrocephalus*) (ထိလွယ်ခိုက်လွယ်ပြီးစိုးရိမ်ရ) ဝေလငါးမျိုးများအပါအဝင် ကြီးမားပြီး ရွှေ့ပြောင်းသွားလာ ကျက်စားတတ်သော ရေပြင်နေ ဝေလငါးများ ကဲ့သို့သော အဏ္ဏဝါနို့တိုက်သတ္တဝါမျိုးစိတ်များရှိကြောင်း သိရှိရပြီး၊ ကမ်းရိုးတမ်း ဧရိယာများရှိ မှတ်တမ်းတင်ထားသည့် ဝေလငါးငယ်မျိုးစိတ်များ (small cetacean species) နှင့် ထိန်းသိမ်းထားသော ရေဝက်များလည်း ပါဝင်ပါသည်။ ကုလသမဂ္ဂက ပတ်ဝန်းကျင်အစီအစဉ် (UNEP) အကြံပြုချက်ဖြစ်သည့် ပင်လယ်လိပ်တစ်မျိုး (olive ridley turtles) သည် A-6 ၏ အရှေ့မြောက်ဘက်ကပ်လျက်ရှိသည့် ဧရာဝတီတိုင်းဒေသကြီး၏ ကမ်းရိုးတမ်း အပါအဝင်ဖြစ်သည့် ရခိုင်ကမ်းရိုးတမ်းဒေသတလျောက်တွင် အသိုက်တည်ဆောက်မွေးဖွားနေနိုင်ကြောင်း အဆိုအရ IUCN ၏ ခြိမ်းခြောက်ခံ လိပ်မျိုးစိတ် ၅ မျိုးစာရင်းပါ လိပ်မျိုးစိတ်များ ရှိနိုင်ပါသည်။ ၎င်းအချက်အလက်မှ အစိမ်းရောင်လိပ်မျိုး (green turtles) သည် ငွေဆောင်မြို့ အနီးအနား/တဝိုက် ကမ်းခြေများတွင် အသိုက်ပြု လုပ်ကြသည်ဟု အကြံပြုထားပါသေးသည်။ လွန်ခဲ့သောရာဖွေရေးလုပ်ငန်းစဉ်များအတွင်း အဏ္ဏဝါဒေသရင်းသတ္တဝါလေ့လာစူစမ်းခြင်းများပြုလုပ်ခဲ့ရာ A-6 တွင် ဝေလငါးငယ်မျိုးစိတ်များ (cetacean) နှင့် လိပ်မျိုးစိတ်များ ရှိနေမှုမှာ နှိုင်းယှဉ်ခြင်းအားဖြင့် နည်းပါးကြောင်း တွေ့ရှိရပြီး၊ စီမံကိန်းဧရိယာအတွင်း ရှိနေသော်လည်း ၎င်းဒေသရင်းမျိုးစိတ်များမှာ များသောအားဖြင့် ရွှေ့ပြောင်း သွားလာနေကြခြင်းဖြစ်ပါသည်။ A-6 တွင် ၂၀၁၆ (ဇူပြီ နှင့် မေလ ၂၀၁၆) ခုနှစ် ဆိုက်စမစ်တိုင်းတာရေးလုပ်ငန်း အတွင်း မြင်တွေ့ ခဲ့ရသည့် မျိုးစိတ်များတွင် sperm ဝေလငါးနှစ်ကောင်၊ Bryde ဝေလငါးမျိုးတစ်ကောင်၊ အမျိုးမျိုးသော လင်းပိုင် မျိုးစိတ်များ နှင့် အမည်ဖော်မရသည့် ဝေလငါးများနှင့် လင်းပိုင်မျိုးစိတ်များ ပါဝင်သည့် ပင်လယ်နို့တိုက် သတ္တဝါများ ပါဝင်ခဲ့ပါသည်။ ဆိုက်စမစ်တိုင်းတာရေးလုပ်ငန်း အတွင်း ပင်လယ်လိပ်များ (olive ridley sea turtles) (အားနဲ့

(1) မြန်မာဂေဟစနစ်စစ်တမ်း (၂၀၁၅)။ FAO-NORAD Project No: GCP/INT/003/NOR. Cruise Report "Dr. Fridtjof Nansen". EAF – N/2015/

သောမျိုးစိတ်) ကို လေ့လာစူးစမ်းမှု ငါးကြိမ် ပြုလုပ်ခဲ့ကြပြီး၊ အမည်ဖော် မရသည့် ပင်လယ်လိပ်များကို လေ့လာစူးစမ်းမှု သုံးကြိမ် ပြုလုပ်ခဲ့ကြပါသည်။

၂၀၁၅ နှင့် ၂၀၁၆ ခုနှစ် တွင် A-6 (ပုသိမ် နှင့် ချောင်းသာ) [1] ၏ အနီးအနား မြို့နယ်များတွင် ပြီးခဲ့သည့် သက်ဆိုင်သူများနှင့် တွေ့ဆုံးဆွေးနွေးပွဲများမှ ကောက်ယူခဲ့သည့် ငါးဖမ်းခြင်းဆိုင်ရာအချက်အလက်များအရ စီမံကိန်းဧရိယာတွင် ဧရာဝတီတိုင်းဒေသကြီးမှ ဒေသခံငါးဖမ်းသူများ မရှိပါ။ ဒေသံငါးဖမ်းသူများတင်ပြကြသည်မှာ အဓိကငါးဖမ်းလုပ်ငန်းကို မြစ်တွင် သို့မဟုတ် ကမ်းခြေမှ ၇ မိုင် (၁၁ ကီလိုမီတာ) ခန့် ထွက်ဖမ်းကြသည် ဟူ၍ ဖြစ်ပါသည်။ ဧရာဝတီတိုင်းဒေသကြီးအပြင်ဘက်မှ စီးပွားဖြစ်ငါးဖမ်းစက်လှေကြီးအချို့ (ဥပမာ - မြန်မာနိုင်ငံ၏ အခြား နေရာများ သို့မဟုတ် အခြားနိုင်ငံတကာမှ စက်လှေများ) သည် စီမံကိန်းဧရိယာတွင် ငါးဖမ်းကောင်း ဖမ်းနေနိုင် ကြသည်။ A-6 တွင် ၂၀၁၅-၂၀၁၆ ခုနှစ် တူးဖော်ရေးကာလအတွင်းဖြစ်သည့် ၅၂ ရက်ကြာအချိန်အတိုင်းအတာ တွင် ငါးဖမ်းလုပ်ငန်း(ဥပမာ-ငါးဖမ်းစက်လှေများကို လေ့လာစူးစမ်းလေ့လာခြင်း) နှင့် အန္တရာယ်ကင်းရှင်းရေးဇုန် ဖြစ်သည့် ၁,၆၄၀ ပေ (၅၀၀ မီတာ) အတွင်း သို့မဟုတ် ခန့် တွင် ရင်ဆိုင်ရမှုများ မရှိခဲ့ပါ။ ၂၀၁၆ ခုနှစ် အကျွာဝါဆိုက်စမစ်တိုင်းတာရေးကာလတွင်၊ A-6 အတွင်းနှင့် အနီးအနားနေရာများတွင် ငါးဖမ်းရေယာဉ် ၁၈ စီး နှင့် ငါးဖမ်းကိရိယာ ၅ ခုကို မြင်တွေ့ခဲ့ကြကြောင်း မှတ်တမ်းတင်ဖော်ပြခဲ့ပါသည်။ စီမံကိန်းဧရိယာ၏ အနီးဆုံးအနားသတ်မျဉ်းသည် အနီးဆုံးကမ်းရိုးတမ်းမှ ၂၁ မိုင် (၃၅ ကီလိုမီတာ) ခန့် အကွာအဝေးတွင် တည်ရှိသောကြောင့်၊ ဒေသခံငါးလုပ်ငန်းရေယာဉ်များနှင့် စီမံကိန်းလုပ်ငန်းရပ်များကြား အပြန်အလှန်ထိတွေ့နိုင်မှုများ ဖြစ်နိုင်ဖွယ် မှာ အင်မတန်မှနည်းပါး ပါသည်။ ဒေသခံရေလုပ်သားများနှင့် တွေ့ဆုံဆွေးနွေးညှိနှိုင်းမှုများတွင် မြန်မာနိုင်ငံရှိ အခြားနေရာများ (ဥပမာ - တနင်္သာရီတိုင်းဒေသကြီး၊ မွန်ပြည်နယ် နှင့် ရန်ကုန်) မှ ရေယာဉ်များသည် A-6 ရေပြင်တွင် ရှိနေနိုင်ကြကြောင်း ဆွေးနွေးကြပါသည်။ ဤရေယာဉ်များသည် စီးပွားဖြစ်လုပ်ကိုင်ကြသည့် ဆွဲပိုက်ရေယာဉ်ကြီး များ/ငါးဖမ်းရေယာဉ်ကြီးများ ဖြစ်ကြကြောင်း ပြောဆိုဆွေးနွေးကြပါသည်။ သို့ဖြစ်ပါ၍ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာအစီရင်ခံစာ၏ ထိခိုက်မှုဆန်းစစ်ချက်နှင့် နယ်ပယ်တိုင်းတာသတ်မှတ်ချက်တွင် ပါရှိပြီးသည့်အတိုင်း စီမံကိန်းဧရိယာအတွင်း ကမ်းလွန်ရေနံတူးဖော်ခြင်းနှင့် ငါးဖမ်းသင်္ဘောများ အကြား အံဝင်ဂွင်ကျဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

A-6 ၏ အနောက်တောင်ထောင့်သည် မြောက်ဘက် (ကာလကတ္တား၊ စစ်တကောင်း၊ စသည့်) ဆိပ်ကမ်းများမှ အနွှယ်၏ တောင်ဘက်စွန်း နှင့် တောင်ဘက်ရှိ Malacca ရေလက်ကြားသို့ ဦးတည်ခုတ်မောင်းကြသော အသုံးပြုမှုနည်းသည့် သင်္ဘောလမ်းကြောင်းအတွင်း တည်ရှိပါသည်။

1.5 ဖြစ်နိုင်ခြေရှိသော အဓိကသက်ရောက်မှုများနှင့် သက်ရောက်မှုကို လျော့နည်းစေနိုင်သော နည်းလမ်းများ

EIA သည် ဖြစ်နိုင်ခြေရှိသောထိခိုက်မှုများနှင့် ထိခိုက်မှုအဆင့်ကို လျော့ကျစေနိုင်မည့် အဆိုပြုလျော့ချရေးလုပ်ငန်းများကို ဆန်းစစ်ထားပါသည်။ EIA သည် ဖြစ်နိုင်ခြေရှိသောသက်ရောက်မှုများမှာ ကာလတိုသာဖြစ်ပြီး၊ ပြီးခဲ့သည့် လုပ်ငန်းအတွေ့အကြုံမှ အဓိက ပတ်ဝန်းကျင်နှင့်လူမှုရေး ပတ်ဝန်းကျင်များပေါ် ဆိုးကျိုးသက်ရောက်မှု

(1) တွေ့ဆုံဆွေးနွေးပွဲများကာလအတွင်း၊ GAD မှ သာပေါင်းမြို့နယ်အတွင်းရှိခဲ့ဖူးသည့် "ရွှေတောင်ယံ" မြို့နယ်သစ်တစ်ခု ရှိကြောင်း Woodside ကို အကြောင်းကြားပါသည်။ ၎င်းမြို့နယ်သစ်အတွင်းတွင်လည်း "ချောင်းသာမြို့နယ်ခွဲ" တစ်ခုရှိကြောင်းလည်းသိရပါသည်။ ချောင်းသာမြို့နယ်ခွဲနှင့် ရွှေတောင်ယံမြို့နယ် နှစ်ခုလုံးသည် သာပေါင်းမြို့နယ် အတွင်းပါဝင်ခဲ့ဖူးပါသည်။ သက်ဆိုင်သူများကို အဆိုပြု စီမံကိန်းအကြောင်း ရှင်းပြ၍ စီမံကိန်းအပေါ် ၎င်းတို့တွင်ရှိသည့် စိုးရိမ်မှုများ၊ မေးခွန်းများ သို့မဟုတ် အမြင်များ ကို ဆွေးနွေးဖြေကြားခဲ့ကြပါသည်။

အထောက်အထားမတွေ့ရှိရကြောင်း နိဂုံးချုပ်တင်ပြထားပါသည်။ ၎င်းဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများနှင့် ယင်းနှင့်ဆက်နွယ်သည့်လျော့ချရေးလုပ်ငန်းစဉ်များကို *ဇယား ၁.၂* တွင် အကျဉ်းချုပ်တင်ပြထားပါသည်။

ဇယား ၁.၂ ဖြစ်ပေါ်လာနိုင်သည့် အဓိကသက်ရောက်မှုများနှင့် အဆိုပြုထားသည့် လျော့ချရေးလုပ်ငန်းများ

ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	သက်ရောက်မှုအား ထိန်းချုပ်/လျော့နည်းစေနိုင်သည့်အချက်များ	ကြွင်းကျန်သက်ရောက်မှု၏ အရေးပါမှုအဆင့်
အနည်အနှစ်အရည်အသွေး၊ ရေအောက်နေသက်ရှိသတ္တဝါများ (benthic communities)၊ ရေအရည်အသွေး၊ ငါး နှင့် ရေပေါ်နေသက်ရှိသတ္တဝါများ (Pelagic comminites) အပေါ် တူးဖော်ရေးဖြတ်စများနှင့် တူးဖော်ရေးအရည်ထုတ်လွှတ်မှုများကြောင့် ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှု	• WBDF ကို ဦးစားပေးအသုံးပြုမည်ဖြစ်ပြီး၊ WBDF သည် လိုအပ်သည့် သတ်မှတ်ချက်သို့ မရောက်ရှိမှသာ NADF ကို အောက်ဖော်ပြပါ သင့်တော်သည့် နည်းပညာဆိုင်ရာအား အသုံးခြင်း။ • ကုန်းဆင်ခြေလျော သန့်ရှင်းရေကျင်းတွင် စွန့်ပစ်မည့် NADF အား ထုထည်အားဖြင့် ပျမ်းမျှ ဆီပါဝင်မှုကို ပမာဏအားဖြင့် ၁ % အောက် ကန့်သတ်ထားခြင်း။ • တွင်းအတွက် ရွှံ့ဖြတ်စများတွင် ပုံမှန် ဆီပါဝင်မှုအား အလေးချိန်အားဖြင့် ၆.၉ % သို့မဟုတ် ယင်းထက်နည်းသည့် ရာခိုင်နှုန်းသို့ ကန့်သတ်ထားခြင်း။ • NADF ကြွင်းကျန်အားလုံးကို ကုန်းပေါ် သို့ပို့ဆောင်ပြီး၊ ပြန်လည် သန့်စင်မှုများ၊ ပြန်လည်းအသုံးပြုမှုများ သို့မဟုတ် စွန့်ထုတ်ခြင်း များ ပြုလုပ်ခြင်း။ • NADF တူးဖော်ရေးအရည်၏ မည်သည့် ကြီးမားသော စွန့်ထုတ်မှု ကိုမှ ကန်းလွန်တွင် ပြုလုပ်မည် မဟုတ်ပါ။ ဖြတ်စများအား သဘော်ပေါ်မှ စွန့်ပစ်ပါက ရေထု(Water Line) အောက်ဆုံးသို့ စွန့်ပစ်ခြင်း၊ • ရေကိုအခြေမခံသော တွင်းတူးရည်စနစ်အား Woodside၏ ရေကို အခြေမခံသည့် တွင်းတူးရည် စတင်အသုံးပြုစဉ်ဆောင်ရွက်ရန် စာရင်း (NADF Start-up Checklist) ဖြင့် အကဲဖြတ်ခြင်း၊ • ရှာဖွေတူးဖော်ရေးလုပ်ငန်းတွင် ပင်လယ် ပတ်ဝန်းကျင်သို့ စွန့်ထုတ် ကောင်း စွန့်ထုတ်နိုင် ခြေရှိသည့် ဓါတုပါဝင်သည့်ပစ္စည်းများ အားလုံးကို Woodside ဓါတုဆိုင်ရာ ဆန်းစစ်ခြင်းလုပ်ငန်းစဉ် (Woodside Chemical Assessment Process) အရ စိစစ်ရွေးချယ်ပြီးမှ အတည်ပြုခြင်း။ • Woodside မှ အတည်ပြုထားသည့် ဓာတုဗေဒ ရွေးချယ်သည့် စာရင်းအား ပုံမှန်ပြန်လည်ဆန်းစစ်သုံးသပ်ခြင်း၊ • လုပ်ငန်းလည်ပတ်စဉ် ကြီးမားသောထုထည် စွန့်ပစ်ခြင်းကို	**မပြောပလောက်သော** (နှုန်းအရည်အသွေး၊ ပုဇွန်၊ဂဏာန်းစသည့် သက်ရှိများရှင်သန်သည့် နှုန်းမျက်နှာပြင်ဂန်းကျင်၊ ရေအရည်အသွေး၊ ငါးနှင့် ပင်လယ်ရေပေါ်လွှာနေ ငါးမျိုးစိတ်များ)
		သာမည (ရေအရည်အသွေး)

ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	သက်ရောက်မှုအား ထိန်းချုပ်/လျော့နည်းစေနိုင်သည့်အချက်များ	ကြွင်းကျန်သက်ရောက်မှု၏ အရေးပါမှုအဆင့်
	ရွေ့လျား တွင်းတူးစင်(MODU) မှတရားဝင်ဆောင်ရွက်ရန် ခွင့်ပြုချက် ရယူ သည့်စနစ် (PTW) အသုံးပြု၍ စီမံခန့်ခွဲခြင်း (စွန့်ပစ်သည့် ဗားခလုတ်/ မှုတ်စက်လည်ပတ်ရန်)၊	
	• ဂ.၆ မိုင် (၁ ကီလိုမီတာ) ထိ မြင်နိုင်စွမ်းရှိသော စောင့်ကြည့်ရေးဇုန်ထားရှိခြင်း။ • မစတင်မီ ကြိုတင်စောင့်ကြည့်ရေးနှင့် ဖြေးညှင်းစွာစတင်သည့် လုပ်ထုံးလုပ်နည်းကို အသုံးပြုခြင်း။ • ဂ.၆ မိုင် (၁ ကီလိုမီတာ) ထိ မြင်နိုင်စွမ်းရှိသော စောင့်ကြည့်ရေး ဇုန် ကို ဝေလငါးများ သို့မဟုတ် ပင်လယ်လိပ်များ စောင့်ကြည့်ရေး အတွက် ဆက်လက်ထားရှိမည် ဖြစ်ပါသည်။ • ကြိုတင်ကာကွယ်ရန်စက်ပိတ်မည့်ဇုန်အဖြစ် ၁,၆၄၀ ပေ (၅၀၀မီတာ) ထားရှိခြင်း၊ • ညအချိန်/မြင်နိုင်စွမ်း အားနည်းချိန်တွင် ဆောင်ရွက်ရမည့် လုပ်ထုံးလုပ်နည်း ကို အသုံးပြုခြင်း။	**သာမည** (ငါးမျိုးစိတ်)
ရေအောက်အသံထုတ်လွှတ်မှုကြောင့် ပင်လယ်ရေနေသတ္တဝါများအပေါ် သက်ရောက်မှု	• အလွှာဂါသတ္တဝါများအားလေ့လာခြင်းနှင့် အစီရင်ခံခြင်းဆိုင်ရာ လိုအပ် ချက်များပါဝင်ရန် စောင့်ကြည့်မည့် သဘော်အမှုထမ်းနှင့် လုပ်ငန်း မစတင်မီ အစည်းအဝေးပြုလုပ်ခြင်း၊ • မြင်ကွင်းမရှင်းလင်းသည့်အချိန်တွင် ဖြေးညှင်းစွာ စတင် အသံထုတ်လွှတ် ခြင်းနှင့် လုပ်ငန်းလည်ပတ် ခြင်းအစီအစဉ်အရ ရေအောက်အသံလှိုင်း လွှင့်ထုတ်ခြင်းအား ရှေ့ပြေးဦးဆုံး (၂၄)နာရီအတွင်း ၃ ကောင် (သို့မဟုတ်) ၃ကောင်ထက် ပိုများသော ဝေလငါးများအား တွေ့ရှိ၍ စက်လုံးဂရပ်နားခြင်း (သို့မဟုတ်) ရှေ့ပြေးဦးဆုံး (၂၄)နာရီ အတွင်း လုပ်ငန်းလည်ပတ် ခြင်းမရှိလျှင်၊ ရှေ့ပြေးဦးဆုံး (၂၄)နာရီအတွင်း ဝေလငါးများအား (၂)နာရီမျှ လုံးဂ မတွေ့ရှိရပါက အသုံးပြုခြင်း၊ • ပင်လယ် VSP လည်ပတ်ရေးကာလအတွင်း သတ္တဝါများ စောင့်ကြည့်ရန် နှင့် မှတ်တမ်းတင်ရန် လေ့ကျင့်ထားသော လုပ်ငန်းအဖွဲ့သားများကို အသုံးပြုခြင်း။	**အသင့်အတင့်** (ပင်လယ်နို့တိုက်သတ္တဝါများ နှင့် လိပ်များ) သို့ရာတွင် လေ့တွေ့တွင် အတတ်နိုင်ဆုံးနည်းနိုင်သမျှနည်း ရန်(ALARP)* ထည့်သွင်းထားပါသည်။

ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	သက်ရောက်မှုအား ထိန်းချုပ်/လျော့နည်းစေနိုင်သည့်အချက်များ	ကြွင်းကျန်သက်ရောက်မှု၏ အရေးပါမှုအဆင့်
ရွှေ့လျားတွင်းတူးစင်နှင့် သဘော်များကြောင့် ငါးဖမ်းလုပ်ငန်းနှင့် သဘော်များသွားလာမှုအား ထိခိုက်မှု	• MODU မှ အချင်း၀က် ၁,၆၄၀ ပေ (၅၀၀မီတာ) အား အန္တရာယ်ကင်းရှင်းရေးဇုန် အဖြစ် လိုအပ်ချက်အရထားရှိခြင်း၊ • MODU နှင့် ထောက်ပံ့ရေးရေယာဉ်များ အနေဖြင့် သဘော်မတိုက် မိအောင် ရှောင်ရှားခြင်း၊ ရေကြောင်းလမ်းညွှန်အတိုင်း သွားလာခြင်းနှင့် ထိန်းသိမ်းစောင့် ရှောက်ခြင်း တို့ကို နိုင်ငံတကာစည်းမျဉ်း စည်းကမ်း များနှင့်အညီ လိုက်နာ ဆောင်ရွက်စေခြင်း၊ • မြန်မာစကားတတ်ကျွမ်းသည့် သဘော် အမှုထမ်းအား MODU တွင်ထားရှိခြင်း၊	**မပြောပလောက်သော** (ငါးဖမ်းလုပ်ငန်းနှင့်သဘော်သွားလာခြင်း)
မျော်လင့်မထားသော ငါးဖမ်းသဘော်များ၊အခြား ပင်လယ်အသုံးပြုသူများနှင့် ထိပ်တိုက်တွေ့ဆုံမှု	• အဆိုပြု အစမ်းတွင်း တူးဖော်မည့် အစီအစဉ်အသေးစိတ်အား စီမံကိန်း နှင့်သက်ဆိုင်သူများထံသို့ အချိန်နှင့် တပြေးညီ အသိပေးခြင်း ကို သေချာစွာပြုလုပ်နိုင်မည့်သက်ဆိုင်သူများ နှင့် ချိတ်ဆက်ဆက်သွယ်ခြင်း အစီအစဉ် (stateholder engagement plan -SEP) ကောင်အထည်ဖော်ခြင်း၊ • ရေကြောင်းသတိပေးချက်ထုတ်ပြန်ခြင်း၊ • စီမံကိန်းနှင့်သက်ဆိုင်သည့် တုံ့ပြန်မှုဆိုင် ရာ လုပ်ထုံးလုပ်နည်းများ အရ ပြည်သူများ၏ နစ်နာချက်၊မကျေနပ်ချက်များအား စုံစမ်း စစ်ဆေး ခြင်းဖြင့်ရရှိလာသော သတင်း အချက်အလက်များအား အချိန်နှင့် တပြေးညီ ဖြန့်ဝေခြင်းနှင့် အကောင် အထည်ဖော် ဆောင်ရွက်ခြင်း၊	**မပြောပလောက်သော** (ငါးဖမ်းလုပ်ငန်းများ၊ သဘော်သွားလာခြင်း နှင့် အသက်မွေးဝမ်း ကျောင်း လုပ်ငန်းများ)
ရွှေ့လျားတွင်းတူးစင်နှင့် ထောက်ပံ့ရေးသဘော်များ၊ စက်ပိုင်းဆိုင်ရာအင်ဂျင်များနှင့် ဓါတ်ငွေ့မီးရှို့ခြင်းမှ ဖန်လုံအိမ်ဓါတ်ငွေ့ထုတ်လွှတ်မှု	• အစမ်းတွင်းစမ်းသပ်ခြင်းကာလအား တတ်နိုင်သမျှ အနည်းဆုံး ဖြစ်ရန် ဆောင်ရွက်ခြင်း၊ • စက်ပစ္စည်းများအား စွမ်းအားမြင့် ဒီဇိုင်းဖြင့် လည်ပတ်ခြင်း၊ • မလောင်ကျွမ်းနိုင်သည့် ဟိုက်ဒရိုကာဗွန်များ ကို လျော့ချနိုင်ရန် စက်များကို ထိန်းသိမ်း ပေးခြင်း၊ • ရေယာဉ်အဆင့်အတန်းအရ လိုအပ်သည့် နိုင်ငံတကာလေထု ညစ်ညမ်းမှု တားဆီးကာကွယ်ရေး အသိအမှတ်ပြု လက်မှတ် (International Air Pollution Prevention Certificate- IAPP) လက်ဝယ်ရှိသည့် ရွှေ့လျားတွင်းတူးစင်နှင့် ထောက်ပံ့ရေးသဘော်များ ကိုသာ အသုံးပြုခြင်း၊	**မပြောပလောက်သော** (လေထုနှင့် ရာသီဥတု)

ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	သက်ရောက်မှုအား ထိန်းချုပ်/လျော့နည်းစေနိုင်သည့်အချက်များ	ကြွင်းကျန်သက်ရောက်မှု၏ အရေးပါမှုအဆင့်
	• ရေယာဉ်အဆင့်အတန်းအရ လိုအပ်သည့် သဘော်ဘစ်မ်းအင် အကျိုးရှိစွာ အသုံးချသည့် စီမံခန့်ခွဲမှုအစီအစဉ် Ship Energy Efficiency Management Plan (SEEMP) ရေယာဉ်များတွင် ပါရှိခြင်း၊ • ဒြပ်ထုအရ ဆာလ်ဖာပါဝင်မှု ၃.၅% ထက် နည်း သော လောင်စာဆီ ကိုသာ အသုံးပြုခြင်း (လောင်စာဆီ ပံ့ပိုးနိုင်မည့် နေရာဒေသအရ)	
မျော်လင့်မထားသော ဆီဖိတ်စင်ခြင်း ကြောင့် ပင်လယ်ရေနေ သတ္တဝါများ နှင့် သက်ရှိများအား ထိခိုက်မှု	• ရေယာဉ်များလုပ်ငန်းလည်ပတ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း စံချိန် စံညွှန်း (Vessel standard operating procedures)နှင့် လောင်စာကန်ဆိုင်ရာလုပ်ထုံးလုပ်နည်း (bunkering procedures) (နေ့အချိန် နာရီတွင် လောင်စာဆီဖြည့်တင်းခြင်း၊ ကွန်ပြူတာဖြင့် စောင့်ကြပ်ကြည့်ရှုခြင်းနှင့် dry break ကြားခံပစ္စည်းအသုံးပြုခြင်းအား ကန့်သတ်ခြင်းအပါအဝင်) များအတိုင်း ဆောင်ရွက်ခြင်း၊ • MODU နှင့် ထောက်ပံ့ရေးရေယာဉ်များသည် (ရေယာဉ်အမျိုးအစားကြောင့်လိုအပ်သလို) MARPOL နှင့်အညီ ဆောင်ရွက်ခြင်း၊ • ရေယာဉ်များတွင် တရားဝင် နိုင်ငံတကာ ဆီညစ်ညမ်းမှု တားဆီး ကာကွယ်ရေး လက်မှတ် (International Oil Pollution Prevention-IOPP Certificate)၊ ဆီဖြည့်တင်းရာတွင် ထိန်းသိမ်း စောင့်ရှောက်သည့်မှတ်တမ်းစာအုပ် (oil record book) နှင့် ရေယာဉ်များပေါ်တွင် ဆီညစ်ညမ်းမှု အရေးပေါ်အစီအစဉ် (Shipboard Oil Pollution Emergency Plan-SOPEP) များထားရှိလိုက်နာဆောင်ရွက်ခြင်း၊ • ရေယာဉ်များတွင် SOPEP အပြင် ဆီဖိတ်စင်ခြင်းအတွက် လိုအပ်သော လုပ်နိုင်စွမ်းဖြင့် ကိုင်တွယ်နိုင်မည့် ဆီညစ်ညမ်းမှု အရေးပေါ် အစီအစဉ် (Oil Pollution Emergency Plan (OPEP) ပါရှိခြင်း၊ • လုံခြုံရေးဆိုင်ရာသတင်းအချက်အလက် (Safety Data Sheet-SDS) အရ ဓာတု ပစ္စည်း နှင့်/သို့မဟုတ် ဟိုက်ဒြိုကာဘွန် များအား ကိုင်တွယ်ခြင်းနှင့်သိုလှောင်ခြင်း၊ • သင့်တော်သည့် အမှိုက်ခွဲခြားခြင်းနှင့် စွန့်ပစ်ခြင်း၊ • MODU နှင့် ထောက်ပံ့ရေးရေယာဉ်များ ပေါ်တွင်	**မပြောပလောက်သော** (အလွှာပါနို့တိုက်သတ္တဝါ၊ ပင်လယ်ငှက်နှင့်ငါး)

ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	သက်ရောက်မှုအား ထိန်းချုပ်/လျော့နည်းစေနိုင်သည့်အချက်များ	ကြွင်းကျန်သက်ရောက်မှု၏ အရေးပါမှုအဆင့်
	ဆီဖိတ်စင်မှုအား ချက်ချင်း အရေးယူဆောင်ရွက်နိုင်သည့် ပစ္စည်းများ (Spill response kits) ထားရှိခြင်း၊ • အကွာဝါဆိုင်ရာလုံခြုံရေးနှင့် ရေကြောင်းသွားလာရေးကျင့်ထုံးနှင့် စံချိန် စံညွှန်းများ အား လိုက်နာခြင်း၊	

* မှတ်ချက်။ အဆိုပြုထားသော လက်ရှိထိန်းချုပ်မှုများမှ သိသာထင်ရှားသော အကြွင်းကျန်သက်ရောက်မှု (residual impact significance) သည် နေရာတွင် အလိုအလျောက်ဆက်လက်တည်ရှိနေပါက (As Low As Reasonably Practicable -ALARP) အဆင့်တစ်ခုအဖြစ် သတ်မှတ်၍ လျော့ချရန် ထည့်သွင်းစဉ်းစားမည် ဖြစ်ပါသည်။ ထို့နည်းတူ ၄င်းအား အလယ်အလတ် ထိခိုက်မှု (Moderate Impact) အဖြစ်ထည့်သွင်းစဉ်းစား၍ အကျိုးရှိရှိနှင့် ထိရောက်စွာ စီမံခန့်ခွဲသွားမည်ဖြစ်ပါသည်။

ဤအစီရင်ခံစာအခန်း (၆)တွင် ဆန်းစစ်ခြင်းအပြင်ဘက် နယ်ပယ်အတိုင်းအတာသက်ရောက်မှုများကို သတ်မှတ်ဖော်ထုတ် ထားသောကြောင့် အထက်ပါဇယားတွင် "အဓိက" အလားအာရှိသည့် သက်ရောက်မှု များကို ထည့်သွင်း မထားပါ။ ဤသက်ရောက်မှုများနယ်ပယ်တိုင်းတာခြင်း၏ အကြောင်းအရင်းများကို *ဇယား ၆.၂* တွင် ဖော်ပြပေးထားပါသည်။ နယ်ပယ်တိုင်းတာခဲ့သည့်သက်ရောက်မှုများတွင် အောက်ပါအချက်တို့ ပါဝင်ပါသည် -

- MODU၊ ထောက်ပံ့ရေးရေယာဉ်(များ)၊ စက်များမှ လေထုတ်လွှတ်မှုကြောင့် လေထုအရည်အသွေးအပေါ် သက်ရောက်နိုင်မှုများ
- MODU ၏ မီးအလင်းရောင်ကြောင့် ပင်လယ်ငါးများ၊ လိပ်များ နှင့် ပင်လယ်ပျော်ဂွက်များအပေါ် သက်ရောက်နိုင်မှုများ
- MODU ပုံမှန်လုပ်ငန်းများ နှင့် ရေယာဉ်များမှ စွန့်ထုတ်မှုများအကြောင့် ပင်လယ်ပတ်ဝန်းကျင်အပေါ် သက်ရောက်နိုင်မှုများ
- MODU နှင့် ထောက်ပံ့ရေးယာဉ်များမှ ထွက်ပေါ်လာမည့် ရေအောက်အသံများကြောင့် သက်ရောက်နိုင်မှုများ
- ပုံမှန်စွန့်ပစ်ပစ္စည်းထွက်ရှိမှု နှင့် စွန့်ပစ်ခြင်းများမှ သက်ရောက်နိုင်မှုများ
- အန္တရာယ်ရှိသည့် သို့မဟုတ် အန္တရာယ်မရှိသည့် စွန့်ပစ်ပစ္စည်း အစဉ်အခဲ မတော်တဆမှုများ (မိလ္လာသိမ်းစနစ်၊ မီးခိုးရောင်ရေ၊ ဆွေးမြည့်လွယ်သည့် စွန့်ပစ်ပစ္စည်းများ နှင့် သဘော်ဝမ်းတွင်စုနေသည့် ရေဆိုးများ မပါဝင်ပါ) မှ ပင်လယ်ပတ်ဝန်းကျင်အပေါ် သက်ရောက်နိုင်မှုများ
- သဘော်သွားလာရာရေစီးအရွေ့ကြောင့် မျိုးစိတ်များဝင်ရောက်လာခြင်း နှင့် MODU/ရေယာဉ် ကိုယ်ထည်၊ အတွင်းနံရံကလိုင်ပေါက်များ သို့မဟုတ် ရေတွင်ထိစပ်နေသည့်ကိရိယာများကြောင့် မျိုးစိတ်များ တစ်နေရာမှ တစ်နေရာသို့ကူးလူးသွားလာခြင်း
- ပစ္စည်းကိရိယာများလွှတ်ချခြင်းကြောင့် ပင်လယ်ဒေရင်းဒေသများအပေါ် သက်ရောက်နိုင်မှုများ
- တူးဖော်ရေးကာလအတွင်း (ရေနံတွင်းတူးဖော်ရေးစတင်ရာတွင်) မမျှော်လင့်ထားသည့်ဓါတ်ငွေ့လေပေါက်များကြောင့် သက်ရောက်နိုင်မှုများ
- ရေနံ သို့မဟုတ် ဓါတ်ငွေ့တွင်း ပွင့်ထွက်ခြင်းကြောင့် သက်ရောက်နိုင်မှုများ
- ရေယာဉ်ဖြင့်တိုက်မိခြင်းကြောင့် ပင်လယ်ရေနေသတ္တဝါများအပေါ် သက်ရောက်နိုင်မှုများ

- ဟိုက်ဒရိုဂျင်ဆာလဖိုက် (H_2S) ထုတ်လွှတ်မှုကြောင့် သက်ရောက်နိုင်မှုများ
- ကမ်းရိုးတမ်းပတ်ဝန်းကျင်နှင့်လူမှုရေး ဇီဝနေရာများအပေါ် သက်ရောက်နိုင်မှုများ (ခရီးသွားလုပ်ငန်း)။

1.6 စီမံကိန်းနှင့်သက်ဆိုင်သူများနှင့် တွေ့ဆုံညှိနှိုင်းခြင်း

ချောင်းသာ နှင့် ပုသိမ် တို့တွင် ၂၀၁၆ ခုနှစ် ဖွန်လက စီမံကိန်းအတွက် တွေ့ဆုံညှိနှိုင်းမှုများ ပြုလုပ်ခဲ့ပါသည်။ ဤလုပ်ကွက်တွင် ရှာဖွေရေးလုပ်ငန်းများအတွက်လည်း ၂၀၁၅ ခုနှစ်က သာပေါင်းနှင့် ပုသိမ် တို့တွင် တွေ့ဆုံညှိနှိုင်းဆွေးနွေးပွဲများ ပြုလုပ်ခဲ့ပါသည်။

ဤ တွေ့ဆုံညှိနှိုင်းဆွေးနွေးခြင်းများက ဒေသခံများသည် တူးဖော်ရေး တွင်းများပြုလုပ်မည့် ဇရိယာတွင် ငါးဖမ်းလုပ်ငန်းများလုပ်ကိုင်လေ့မရှိကြောင်း၊ ထို့ကြောင့် စီမံကိန်းလုပ်ငန်းများနှင့် ဒေသခံငါးဖမ်းလုပ်ငန်းများကြား နေရာထပ်တူကျနိုင်ခြေမရှိကြောင်း အတည်ပြုခဲ့ပါသည်။ စီမံကိန်းဆိုင်ရာ တွေ့ဆုံ ညှိနှိုင်းမှုများကို ၂၀၁၆ ခုနှစ် ဖွန်လ တွင်ပြုလုပ်ခဲ့ပြီး၊ ရာသီဥတုဆိုးရွားမှု နှင့် မိုးသဲထန်စွာရွာသွန်းသည့် မုတ်သုံ ကာလ (ဖွန်လမှ စက်တင်ဘာလ) ဖြစ်သောကြောင့်၊ သင့်လျော်သော ဇရိယာများကို ရောက်ရှိအောင် EIA ဆောင်ရွက်စဉ်ကာလအတွင်း နောက်ဆုံးအခွင့်အရေးအနေဖြင့် ဆောင်ရွက်ခဲ့ကြပါသည်။ ညှိနှိုင်းမှုအစည်းအဝေးများ ၏ နေ့ရက်၊ တည်နေရာများ၊ သက်ဆိုင်သူများ နှင့် ရည်ရွယ်ချက်များကို *ဇယား ၁.၃* တွင် ဖော်ပြထားပါသည်။

ရွှေသောင်ယံ မြို့နယ်၊ ချောင်းသာ မြို့နယ်ခွဲ သာပေါင်း မြို့နယ် များမှ ကိုယ်စားလှယ်များကို ဖွန်လ (၂၆)ရက်နေ့တွင် ချောင်းသာမြို့ လူထုစည်းဝေးခန်းမ သို့ တက်ရောက်ရန် ဖိတ်ကြားခဲ့ပါသည်။ သို့ရာတွင် စီမံကိန်းလုပ်ငန်းဇရိယာကမ်းဝေးတည်နေရာအရ၊ ကမ်းရိုးတမ်းနှင့် ဆက်စပ်နေသည့် ဒေသခံကျေးရွာလူထုသို့ သက်ရောက်နိုင်ခြေမရှိသောကြောင့်၊ ဒေသခံများနှင့် တိုင်ပင်ညှိနှိုင်းရေးကို ရေလုပ်သားများနှင့် ၎င်းတို့၏ ကိုယ်စားလှယ်များနှင့် ဦးစားပေး ဆောင်ရွက်ခဲ့ပါသည်။

ညှိနှိုင်းဆွေးနွေးပွဲများမှ ရေနံတွင်းတူးဖော်မည့် ဇရိယာသည် ငါးဖမ်းဇရိယာနှင့်ဝေးကွာနေပြီး၊ စီမံကိန်းလုပ်ငန်းများ နှင့် ငါးဖမ်းလုပ်ငန်းများသည် တစ်ထပ်တည်းကျနိုင်ရန် အလွန်နည်းပါးကြောင်း အတည်ပြုခဲ့ပါသည်။

၎င်းဒေသများသို့ရောက်ရှိရန်အခက်အခဲများဖြစ်ပေါ်သည့် မုတ်သုံမိုးရာသီ (ဖွန်လ နှင့် စက်တင်ဘာလ) နှင့် ရာသီဥတု ဆိုးရွားသောအခြေအနေများကြောင့် EIA လေ့လာရေးကာလ ဆွေးနွေးတွေ့ဆုံရန် နောက်ဆုံးအခွင့်အရေးအနေဖြင့် တွေ့ဆုံညှိနှိုင်းမှုများကို ၂၀၁၆ ခုနှစ် ဖွန်လတွင် ပြုလုပ်ခဲ့ခြင်းဖြစ်ပါသည်။

အစည်းအဝေးများ၏ ရက်စွဲ၊ တည်နေရာ၊ သက်ဆိုင်သူများ နှင့် ရည်ရွယ်ချက်များကို *ဇယား ၁.၂* တွင် ဖော်ပြပေးထားပါသည်။

ဇယား ၁.၃ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းနှင့် အခြားသင့်လျော်သော တွေ့ဆုံညှိနှိုင်းမှု အတွင်း ဆောင်ရွက်ခဲ့သည့် လုပ်ငန်းစဉ်များ

နေ့ရက် & တည်နေရာ	သက်ဆိုင်သူများ	ရည်ရွယ်ချက်
၂၀၁၅ – ၂၀၁၅ ခုနှစ်နောက်ပိုင်း/၂၀၁၆ ခုနှစ်အစောပိုင်းတွင် ပြုလုပ်ခဲ့သည့် ဆိုက်စမစ်တိုင်းတာရေးနှင့် ရှာဖွေတူးဖော်ရေးများ		
၂၀၁၅ ခုနှစ် ဇွန်လ ၂၄ ရက်၊ နေပြည်တော်	ငါးလုပ်ငန်းဦးစီးဌာန (DoF)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များ တောင်းခံရယူခြင်း
၂၀၁၅ ခုနှစ် မတ်လ ၁၈ ရက်၊ ပုသိမ်	အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန (GAD), ဧရာဝတီတိုင်းဒေသကြီးအစိုးရအဖွဲ့ (ဧရာဝတီတိုင်းဒေသကြီး ဝန်ကြီးချုပ်အပါအဝင် အစိုးရအဖွဲ့ဝင် ၈ ဦး)	• စီမံကိန်းထုတ်ပြန်ခြင်း • တိုင်းဒေသကြီးအစိုးရတာဝန်ရှိသူများမှ မှတ်ချက်များနှင့် အကြံဉာဏ်များ ရယူခြင်း
၂၀၁၅ ခုနှစ် မတ်လ ၂၈ ရက်၊ သာပေါင်းမြို့	သာပေါင်းမြို့နယ်ကိုယ်စားလှယ်များ – မြို့နယ်အုပ်ချုပ်ရေးမှူး၊ အစိုးရတာဝန်ရှိသူများ၊ ဒေသခံရေလုပ်သားကိုယ်စားလှယ်များ	• စီမံကိန်းထုတ်ပြန်ခြင်း • မေးခွန်းများဖြေကြားခြင်း • သက်ဆိုင်သူများကို စီမံကိန်းနှင့် ဆိုင်သည့် အဆက်အသွယ်များ ပေးခြင်း
၂၀၁၅ ခုနှစ် ဧပြီလ ၃၀ ရက်၊ ပုသိမ်	မြန်မာနိုင်ငံငါးလုပ်ငန်းအဖွဲ့ချုပ် (MFF) – ဧရာဝတီတိုင်း	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များတောင်းခံခြင်း – ဧရာဝတီတိုင်းဒေသကြီး အသေးစိတ် ရေလုပ်ငန်းများ
၂၀၁၅ ခုနှစ် မေ ၂၅ ရက်၊ ရန်ကုန်	မြန်မာ့စီးပွားရေးကဏ္ဍ တာဝန်ယူမှုရရှိရေး အထောက်အကူပြုဌာန (MCRB)	• အဏ္ဏဝါဆိုက်စမစ်တိုင်းတာရေး နှင့် ရှာဖွေတူးဖော်ရေး ဆိုင်ရာ တွေ့ဆုံညှိနှိုင်းရေး လုပ်ငန်းများ အတွက် နောက်ဆက်တွဲ အစည်းအဝေး
၂၀၁၆ ခုနှစ် ဇွန်လ ၁၀ ရက်၊ ရန်ကုန်	မြန်မာ့စီးပွားရေးကဏ္ဍ တာဝန်ယူမှုရရှိရေး အထောက်အကူပြုဌာန (MCRB)	• အဏ္ဏဝါဆိုက်စမစ်တိုင်းတာရေး နှင့် ရှာဖွေတူးဖော်ရေး ဆိုင်ရာ တွေ့ဆုံညှိနှိုင်းရေး လုပ်ငန်းများ အတွက် နောက်ဆက်တွဲ အစည်းအဝေး
၂၀၁၅ ခုနှစ် မေလ ၂၈ ရက်၊ ရန်ကုန်	အပြည်ပြည်ဆိုင်ရာ တောရိုင်းတရိစ္ဆာန်နှင့် သဘာဝ အပင်များအဖွဲ့ (Fauna and Flora International)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များတောင်းခံခြင်း
၂၀၁၅ ခုနှစ် မေလ ၂၈ ရက်၊ ရန်ကုန်	သားငှက်ထိန်းသိမ်းရေးအဖွဲ့ (WCS)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များတောင်းခံခြင်း

နေ့ရက် & တည်နေရာ	သက်ဆိုင်သူများ	ရည်ရွယ်ချက်
၂၀၁၅ ခုနှစ် မေလ ၂၉ ရက်၊ ရန်ကုန်	Istituto Oikos	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များ တောင်းခံခြင်း
၂၀၁၆ – လက်ရှိစီမံကိန်းအတွက်		
၂၀၁၆ ခုနှစ် ဖွန်လ ၁၃ ရက်၊ ပုသိမ်	ငါးလုပ်ငန်းဦးစီးဌာန (DoF)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များတောင်းခံခြင်း
၂၀၁၆ ခုနှစ် ဖွန်လ ၁၄ ရက်၊ ချောင်းသာ	ရွှေတောင်ယံ နှင့် မြို့နယ်ခွဲ - ချောင်းသာ * မှ ကိုယ်စားလှယ်များအပါအဝင် မြို့နယ်အစည်းအဝေး	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များ တောင်းခံခြင်း
၂၀၁၆ ခုနှစ် ဖွန်လ ၁၄ ရက်၊ ပုသိမ်	ဧရာဝတီတိုင်းဒေသကြီး၏ ဝန်ကြီးချုပ်ရုံးတွင် ဝန်ကြီးများနှင့်အစည်းအဝေး (လျှပ်စစ်နှင့်စွမ်းအင်၊ စက်မှု နှင့် ပို့ဆောင်ရေး ဝန်ကြီး၊ ECD ညွှန်ကြားရေးမှူးလက်ထောက်၊ ပုသိမ် GAD ၏ တိုင်းဒေသကြီးဆိုင်ရာ အတွင်းဝန် နှင့် DoF ၏ ညွှန်ကြားရေးမှူးတို့ပါဝင်ကြပါသည်)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များတောင်းခံခြင်း • တိုင်းဒေသကြီးအစိုးရတာဝန်ရှိသူများမှ မှတ်ချက်များ နှင့် အကြံဉာဏ်များ ရယူခြင်း
၂၀၁၆ ခုနှစ် ဖွန်လ ၁၆ ရက်၊ ရန်ကုန်	မြန်မာနိုင်ငံငါးလုပ်ငန်းအဖွဲ့ချုပ် (MFF)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များ တောင်းခံခြင်း
၂၀၁၆ ခုနှစ် ဖွန်လ ၁၆ ရက်၊ ရန်ကုန်	ငါးလုပ်ငန်းဦးစီးဌာန (DoF)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များတောင်းခံခြင်း
၂၀၁၆ခုနှစ်၊ ဖွန်လ (၁၈)ရက်၊ MCRB ရုံး	Myanmar Centre for Responsible Business (MCRB)	• စီမံကိန်းထုတ်ပြန်ခြင်း • သတင်းအချက်အလက်များတောင်းခံခြင်း
၂၀၁၆ခုနှစ်၊ အောက်တိုဘာလ (၂၆)ရက်၊ တယ်လီဖုန်းနှင့် ဆက်သွယ်ခြင်း	ဟိုတယ်နှင့်ခရီးသွားလာရေးလုပ်ငန်း၊ ချောင်းသာနှင့် ငွေဆောင်မြို့	• သတင်းအချက်အလက်များတောင်းခံခြင်း

* A-6 အနီးတွင် မြို့နယ်နှစ်ခုရှိပါသည်။ ပုသိမ်နှင့် သာပေါင်းတို့ဖြစ်ကြသည်။ ၂၀၁၆ ခုနှစ် တွေ့ဆုံဆွေးနွေးပွဲများကာလအတွင်း၊ GAD မှ သာပေါင်းမြို့နယ်အတွင်းရှိခဲ့ဖူးသည့် "ရွှေတောင်ယံ" မြို့နယ်သစ်တစ်ခု ရှိကြောင်း Woodside ကို အကြောင်းကြားပါသည်။ ၎င်းမြို့နယ်သစ် အတွင်းတွင်လည်း "ချောင်းသာမြို့နယ်ခွဲ" တစ်ခုရှိကြောင်းလည်းသိရပါသည်။ ချောင်းသာမြို့နယ်ခွဲနှင့် ရွှေတောင်ယံ မြို့နယ်နှစ်ခုလုံးသည် သာပေါင်းမြို့နယ် အတွင်းပါဝင်ခဲ့ဖူးပါသည်။ သက်ဆိုင်သူများကို အဆိုပြု စီမံကိန်းအကြောင်း ရှင်းပြ၍ စီမံကိန်းအပေါ် ၎င်းတို့တွင်ရှိသည့် စိုးရိမ်မှုများ၊ မေးခွန်းများ သို့မဟုတ် အမြင်များ ကို ဆွေးနွေးဖြေကြားခဲ့ကြပါသည်။

ဒေသအဆင့်နှင့် နိုင်ငံတော်အဆင့်တွင် စီမံကိန်းဆိုင်ရာအချက်အလက်များကို ထုတ်ပြန်နိုင်ရန်နှင့် စီမံကိန်းဧရိယာ၏ အခြေခံအချက်အလက်များကို အတည်ပြုရန် ဤအစည်းအဝေးများကို ပြုလုပ်ဆောင်ရွက်ခဲ့ပါသည်။ တွေ့ဆုံညှိနှိုင်းရေးအစည်းများ၏ရလဒ်အကျဉ်းချုပ်ကို အောက်တွင် ဖော်ပြထားပါသည် -

- ချောင်းသာတွင် သက်ဆိုင်သူများနှင့် မြို့တော်ခန်းမ ပုံစံ တွင် အစည်းအဝေးကို ပြုလုပ်ခဲ့ပါသည်။ ဤတွေ့ဆုံပွဲကို ဒေသခံ GAD၊ ချောင်းသာ၏ အနီးအနားကျေးရွာများမှ ဒေသခံရေလုပ်သားများ၊ သဘောက်ကန် (Tha Bock Kan)၊ ဝတ်သဲ (Wout Thay)၊ ရွှေတောင်ယံ၊ ခံကြီး နှင့် အောင်မင်္ဂလာကျွန်း အပါအဝင် (မြန်မာ့အမျိုးသမီးအသင်းကဲ့သို့သော) ဒေသအခြေပြုအဖွဲ့အစည်းများလည်း တက်ရောက်ခဲ့ကြပါသည်။
- မြို့တော်ခန်းမ အစည်းအဝေးအတွင်း ဒေသခံရေလုပ်သားများသည် ယေဘုယျအားဖြင့် မြစ်ဝကျွန်းပေါ် ဒေသ မြစ်များအတွင်း သို့မဟုတ် ကမ်းရိုးတမ်းမှ ရေမိုင် ၁၀ မိုင် (nm) (၁၁.၅ မိုင်၊ ၁၈.၅ ကီလိုမီတာ) အတွင်း ကမ်းနီးငါးဖမ်းဇရိယာများတွင် ငါးဖမ်းလုပ်ငန်းများဆောင်ရွက်ကြကြောင်း အတည်ပြုပြောကြားကြပါသည်။ အချို့ (အရှည် ပေ ၉၀ ကျော်ရှိသည့်) ပါဆိန်း (purse seine) ငါးဖမ်းရေယာဉ်ကြီးများသည် ကမ်းရိုးတမ်းမှ မိုင် ၃၀ (၄၈ ကီလိုမီတာ) အထိ ထွက်ဖမ်းကြကြောင်းလည်း သိရှိရပါသည်။
- A-6 ရေပြင်အတွင်း မြန်မာနိုင်ငံ အခြားနေရာများ (ဥပမာ - တနင်္သာရီ တိုင်းဒေသကြီး၊ မွန်ပြည်နယ်နှင့် ရန်ကုန်) မှ ရေယာဉ်များရှိနိုင်ကြောင်းလည်းသိရပါသည်။ ၎င်းရေယာဉ်များမှာ စီဗွားဖြစ်လုပ်ကိုင်ကြသည့် ဆွဲပိုက်များအသုံးပြုသည့်ရေယာဉ်ကြီးများဖြစ်ကြပါသည်။
- မေးခွန်းများတွင် ဓါတုအသုံးပြုမှုကြောင့် အလွှာဝါနှံတိုက်သတ္တဝါများအပေါ် သက်ရောက်မှုများနှင့် အန္တရာယ်ရှိသည့် စွန့်ပစ်ပစ္စည်း နှင့် အန္တရာယ်မရှိသည့် စွန့်ပစ်ပစ္စည်းများ၏ စီမံခန့်ခွဲမှုများ စသည်တို့ပါဝင်ကြပါသည်။
- ကမ်းရိုးတမ်းဒေသလုပ်ငန်းများအပေါ် အခြား အလားအလာရှိသော ထိခိုက်မှုများမရှိကြောင်းအား သတ်မှတ်နိုင်ခဲ့ပြီး ယေဘုယျအားဖြင့်၊ ကမ်းရိုးတမ်းရပ်ရွာအသိုက်အဝန်းကို မထိခိုက်သရွေ့၊ ဒေသခံလူထုမှ စီမံကိန်းကို ထောက်ခံ ကြပါသည်။

1.7 နိဂုံးနှင့် အကြံပြုချက်များ

ဤအခြေအနေတွင်၊ စီမံကိန်းဇရိယာ အတွင်း ငါးလုပ်ငန်းများကိုဖြစ်ပေါ်လာနိုင်သည့်သက်ရောက်မှုနှင့် ကန့်သတ်ချက်များ အနေဖြင့် အနည်းငယ်ရှိနိုင်ပါသော်လည်း ဒေသခံ ငါးဖမ်းလုပ်သားများအပေါ် ထိခိုက်သက်ရောက်မှုအနေဖြင့် မရှိနိုင်ပါ။ ဇရာဝတီတိုင်းဒေသကြီးတွင် အထူးသဖြင့် စီမံကိန်း ဇရိယာ ရှိ ရေလုပ်သားအုပ်စုများများနှင့် တွေ့ဆုံဆွေးနွေးမှုများအရ သေချာမှုအား ရယူနိုင်ခဲ့ပါသည်။ သို့ဖြစ်ပါ၍

ကမ်းဝေး/ပင် လယ်ပြင် ရေလုပ်ငန်း နှင့် / သို့မဟုတ် ၎င်းတို့၏ ကိုယ်စားလှယ်များ နှင့် စပ်လျဉ်း၍ နောက်ထပ် တွေ့ဆုံ ညှိနှိုင်းမှုနှင့် ထုတ်ပြန်ခြင်းများကို ရန်ကုန်နှင့်/သို့မဟုတ် နေပြည်တော် ရှိ DoF သို့မဟုတ် MFF နှင့် ပြုလုပ်ရန် အလားအလာရှိပါသည်။

ကမ်းရိုးတမ်းမှ ၂၁ မိုင် (၃၅ ကီလိုမီတာ) ကျော် အကွာအဝေး အပြင်ဘက်နေရာများ (ဥပမာ - A-6 အတွင်း နှင့် အဆိုပြု တူးဖော်ရေး တွင်းများနေရာ) တွင် ဇရာဝတီရေလုပ်သားများမှ ငါးဖမ်းလုပ်ငန်းများမှာ မရှိသလောက် နည်းပါး ကြောင်း စီမံကိန်းသက်ဆိုင်သူများတွေ့ဆုံညှိနှိုင်းပွဲတွင် အတည်ပြုခဲ့ပါသည်။

အချက်အလက်များကို ပင်ရင်းမူလ အချက်အလက်များ (ဇရာဝတီတွင် ပြုလုပ်ခဲ့သည့် တွေ့ဆုံညှိနှိုင်းမှုများ)မှလည်းကောင်း၊ တဆင့်ခံ အချက် အလက်များ (သုတေသနစာတမ်းများ နှင့် အခြား အချက်အလက်နေရာများ) မှလည်း စုစည်း ခဲ့ပါသည်။ စီမံကိန်း၏ ပမာဏနှင့်သဘောသဘာဝတွင်၊ EIA အစီရင်ခံစာ၌ တင်ပြမည်ဖြစ်ပြီး၊ ပြုလုပ်လိမ့်မည့် သက်ရောက်မှု ဆန်းစစ်ချက်၏ ခိုင်ခံမှုကို အကျိုးသက်ရောက်နိုင်မည့် လက်ရှိလေ့လာသိရှိထားမှု တွင် ကြီးမားသည့် ကွာဟမှုများ မရှိပါ။

အဆိုပြုစီမံကိန်းဖြစ်သော ရေနံလုပ်ကွက် A-6 တွင် ရေနံအစမ်းတွင်းတစ်တွင်းတူးဖော်ခြင်းဆိုင်ရာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလေ့လာမှုအား မြန်မာနိုင်ငံမှ ပြဌာန်းထားရှိသည့် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းလုပ်ထုံးလုပ်နည်းအရ ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအရ JV အနေဖြင့် လုပ်ငန်းဆောင်ရွက်စဉ်အတွင်း စီမံကိန်းနှင့် ပတ်သက်ဆက်နွယ်သည့် အလားအလာရှိသော အဓိကကျသည့် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထိခိုက်မှုများကို ယေဘူယျကျကျ ဆန်းစစ်ရန် နားလည်သည့်အားလျော်စွာ ဆောင်ရွက်ခဲ့ပြီးဖြစ်ပါသည်။ စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာမည့် ထိခိုက်မှုများအား စီမံခန့်ခွဲရန် ကိရိယာတစ်ခု အဖြစ်လည်းကောင်း၊ လေးစားလိုက်နာရမည့် ဥပဒေပြုမှုနှင့် ကောင်းမွန်၍ တိကျသေချာပြီး လက်တွေ့ကျသည့် စံချိန်စံညွှန်းများအား အဆိုပြုထားသည့် A-6 တွင် အစမ်းတွင်းတူးဖော်သည့်အစီအစဉ်အတွင်း လိုက်နာဆောင်ရွက်ရန် လည်းကောင်း၊ စီမံကိန်း၏သတ်မှတ်ချက် တစ်ခုအဖြစ်ဆောင်ရွက်ရန် ရည်မှန်းထားရှိသည့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) အား သီးခြား အစီရင်ခံစာတစ်စောင်အဖြစ် ယခုပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာနှင့်အတူ တင်ပြသွားမည် ဖြစ်ပါသည်။ ထောက်ခံတင်ပြထားသည့် ထိခိုက်မှုများအား လျော့ချနိုင်မည့်နည်လမ်းများကို ကျွမ်းကျင် ပညာရှင်များနှင့် လက်ခံနိုင်သည့် နည်းလမ်းများဖြင့် လက်တွေ့ကျကျ အကောင်အထည်ဖော် ဆောင်ရွက်ပါက စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သည့် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထိခိုက်မှုများအား စနစ်တကျ စီမံခန့်ခွဲနိုင်မည် ဖြစ်ပါသည်။ ယခု ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုဆန်းစစ်ခြင်း လေ့လာမှုမှ စီမံကိန်းကြောင့် ပတ်ဝန်းကျင်နှင့် လူများအား ကြီးမားစွာထိခိုက်နိုင်မှု မရှိသည့်ပြင် ထိခိုက်မှုအားလုံးအား အနည်းဆုံးအဆင့် (ALARP) ရောက်ရှိသည်အထိ ကျိုးကြောင်းခိုင်လုံစွာ လက်တွေ့ကျကျ လျော့ချနိုင်မည်ဟု သုံးသပ်ရရှိပါသည်။

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီအစဉ်အရ သတင်းအချက်အလက် ထုတ်ပြန်ရာတွင် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာအကျဉ်းချုပ်(မြန်မာဘာသာဖြင့်)ကို ပုသိမ်ရှိ GAD နှင့် DoF ရုံးများတွင်ထားရှိသွားမည်ဖြစ်ပြီး အစီရင်ခံစာ ဖြန့်ဝေခြင်းအား သတင်းစာ(၂)ခုဖြစ်သည့် ကြေးမုံသတင်းစာ နှင့် မြန်မာ့အလင်းသတင်းစာ တို့တွင် ကြေညာသွားမည်ဖြစ်ပါသည်။ ထိုနည်းတူစွာ စီမံကိန်း နှင့် ပတ်သက်သည့် မကျေနပ်ချက်၊ နစ်နာချက်များနှင့် ပတ်သက်သည့် သတင်းအချက်အလက်များကို သက်ဆိုင်သူများအား အသိပေးထုတ်ပြန်သွားမည် ဖြစ်ပါသည်။ ဒေသခံများနှင့် အခြား ကမ်းရိုးတမ်းဒေသရှိ လုပ်ငန်းများအား ထိခိုက်မှုမရှိနိုင်ဟု သုံးသပ်ထားသော်လည်း ဆက်လက်ဆောင်ရွက်မည့်စီမံကိန်းဆိုင်ရာအချက်အလက်များအား ဒေသတွင်းသို့ သတင်းစာနှင့်ရေဒီယိုများမှ တဆင့် ကြော်ငြာခြင်းနှင့် အခြားဆက်သွယ်ရေးလမ်းကြောင်းများမှ တဆင့် ထုတ်ပြန်သွားမည်ဖြစ်ပါသည်။

သတင်းဖြန့်ဝေမည့် အသေးစိတ်အစီအစဉ်အား စီမံကိန်း မစတင်မီ ရေးဆွဲပြီး၊ အကောင်အထည်ဖော် ထုတ်ပြန်သွားမည် ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း လုပ်ငန်းစဉ် တစ်ခုဖြစ်သော လူထုနှင့်တွေ့ဆုံညှိနှိုင်းခြင်းအား ဆောင်ရွက်ခဲ့ပြီး ဖြစ်ပါသည်။ သို့ရာတွင် လူထုနှင့်တွေ့ဆုံ ညှိနှိုင်းခြင်းသည် စီမံကိန်းလုပ်ငန်းသက်တမ်းတစ်လျှောက်လုံး ဆောင်ရွက်သွားရမည့် လုပ်ငန်းစဉ်တစ်ခု ဖြစ် ပါသည်။ ထို့ကြောင့် လူထုတွေ့ဆုံညှိနှိုင်းခြင်းကို အဆိုပြုတူးဖော်ရေးအစီအစဉ်တစ်လျှောက်လုံး ဆက်လက် ဆောင်ရွက်သွားရမည် ဖြစ်ပါသည်။ Woodside မှ လူထုနှင့်တွေ့ဆုံညှိနှိုင်းခြင်းအစီအစဉ် (SEP) အား ဆက်လက် ဆောင်ရွက်ခြင်းဖြင့် စီမံကိန်းအကောင်အထည်ဖော် ဆောင်ရွက်နေမှုအခြေအနေများ နှင့်စပ်လျဉ်း၍ သက်ဆိုင် သူများထံမှ တင်ပြလာသည့်စိုးရိမ်မှုများကို ၎င်းတို့ထံသို့ ပြန်ကြားတင်ပြ သွားနိုင်မည်ဖြစ်ကြောင်း တင်ပြလျက် နိဂုံးချုပ်အပ်ပါသည်။

2 INTRODUCTION

2.1 PROJECT OVERVIEW

This document is the Environmental Impact Assessment (EIA) Report for a proposed drilling program in Block A-6 (A-6) in the Rakhine Basin (the "Project"). This EIA Report has been prepared for the approval of the Ministry of Natural Resources and Environmental Conservation (MONREC), in compliance with the Myanmar Environmental Impact Assessment Procedure (EIA Procedure) 2015 (Notification No. 616 / 2015; dated 29 December 2015). As per the EIA Procedure, this project requires an EIA Report and an Environmental Management Plan (EMP) to be prepared and submitted to MONREC.

The 2017 program will include up to two wells, one of which is a firm well and one of which is optional(5). Depending on the outcome from the 2017 drilling, and subject to decisions by the A-6 JV an additional four wells may be drilled over 2018 and 2019.

In 2013, Woodside Energy (Myanmar) Pte Ltd (Woodside) entered a farm-in agreement with MPRL E&P Pte Ltd (MPRL E&P) with respect to A-6 in the Rakhine Basin. In 2015, Total E&P Myanmar (Total E&P) farmed in to A-6. Woodside, Total E&P and MPRL E&P hold 40%, 40% and 20% interests respectively in the JV. Woodside is a joint operator.

In accordance with the EIA Procedure, the first stage of the Project was screening which included the submission of the Project Proposal Report (PPR) to Myanmar Oil and Gas Enterprise (MOGE) (for onward submission to MONREC) which was prepared and submitted in June 2016. Following this, the Environmental Conservation Department (ECD) of MONREC responded to the PPR in writing in August 2016, instructing Woodside to undertaken an EIA for the proposed drilling activities. Woodside then prepared and submitted a Scoping Report which included the Terms of Reference for the EIA Study. This was submitted to MOGE on 7 September 2016.

Woodside, on behalf of the JV, drilled an exploration commitment well in A-6 over a 52 day period from 27 November 2015 to 17 January 2016. The well, Shwe Yee Htun-1, is located about 33 miles (54 kilometres (km)) offshore Myanmar in about 6560 feet (ft) (2000 metres (m)) water depth and 4 miles (7 km) off the edge of the continental shelf (*Figure 1.1*). The well reached a total depth of 17,408 ft (5306 m). A dry gas column of about 423 ft (129 m) was intersected. In addition, a seismic survey was also conducted in April and May 2016 in A-6.

Woodside, on behalf of the JV, has commissioned Environmental Resources Management (ERM) to undertake the EIA Study for the Project. ERM has engaged national environmental consultant E Guard Environmental Services Co. Ltd (E Guard) to provide local Myanmar expertise. Woodside advised MONREC in writing as to the selection of ERM and E Guard, to undertake the EIA investigation. This was noted with no objection by MONREC in writing on 27 June 2016.

This document is the EIA Report for the Project in A-6. A separate EMP has also been prepared alongside this report for submission to, and approval, by MONREC.

The details of the Project are summarised in *Table 2.1*.

(5) An optional activity such as the second 2017 well will only be executed if the JV decides to proceed at some point in the future.

Table 2.1 Summary of Proposed Project Details

	Details
Block	A-6, Offshore Myanmar as per *Figure 1.1*
Joint Venture Participants	Woodside Energy – 40 % (Joint operator and operator of the Project) Total E&P – 40% (Non-operator of the Project) MPRL E&P – 20% (Non-operator of the Project)
Project Area and distance from coastline	At its closest point, the A-6 Project Area is about 21 miles (35 km) from the Myanmar coastline.
Previous Activities in A-6 and operator for the activity	Two-dimensional (2D) marine seismic survey in 2009 (MPRL E&P) Three-dimensional (3D) marine seismic survey in 2010 (MPRL E&P) Drilling of Pyi Thar-1 well in 2012 (MPRL E&P) Drilling of Pyi Thar-1ST well in 2012 (MPRL E&P) 3D marine seismic survey in 2013 (Woodside) Drilling of Shwe Yee Htun-1 well in 2016 (Woodside) 3D marine seismic survey in April 2016 (Woodside)
Scope of Proposed exploration activities for which approval is sought	2017 – Drilling of two wells, one firm and one optional 2018/19 - The potential drilling of four wells. This is dependent on the outcomes of the 2017 drilling and has not yet been decided by the JV.
Consultants for proposed activity	ERM and E Guard

2.2 PROJECT PROPONENT

Woodside is the operator in A-6 (See *Table 2.1*). Contact details for the Woodside country manager are provided below:

Name: Mr Daniel Clery

Position: Country Manager

Address: 70/LA-2 Golden Valley Road, Bahan Township, Yangon, Myanmar

Phone: +95 1 514379

Email: **daniel.clery@woodside.com.au**

Following a farm-in by Woodside in 2013, Woodside holds a 40% interest in A-6 (with the remaining being 40% Total E&P, 20% MPRL E&P) and is the operator (*Table 2.2*).

Table 2.2 Details on A-6 Operators and Participants

Participant	% Share	Operator
Woodside Energy (Myanmar) Pte Ltd	40	Joint operator and operator of the Project
MPRL E&P	20	Non-operator of the Project
Total E&P Myanmar	40	Non-operator of the Project

2.3 EIA OBJECTIVES

The objective of the EIA Study is to complete a robust environmental and social assessment for the Project in compliance with the EIA Procedure. Specifically, the objectives of the EIA are:

- To review the potential interactions between the Project activities and the key environmental and social receptors and resources.
- To identify the potentially sensitive environmental and social components of the baseline.
- To identify and evaluate potential environmental and social Project impacts.
- To recommend mitigation or enhancement measures to remove, reduce or avoid potential adverse impacts.
- To provide a Project specific EMP. This EMP will also cover social impacts.
- To summarise public consultation and disclosure activities related to the Project.

2.4 ENVIRONMENTAL AND SOCIAL CONSULTANT TEAM

The key ERM and E Guard environmental and social consultants that conducted the EIA Study are presented in *Table 2.3*; curricula vitae (CVs) of key personnel are provided in ***Annex 2.1***. The key consultants presented below are supported by a selection of professional and technical staff from ERM and E Guard based in Myanmar, Hong Kong and Australia.

Table 2.3 Environmental and Social Consultants for the Proposed Project

Team	Name	Role	Organisation	Academic Experience	Years' Experience
Project Management Team	Craig A. Reid	Project Director	ERM	BSc	18
Project Management Team	Jonathan Perry	Technical Lead	ERM	MSc	20
Project Management Team	Bethwyn Lewis	Project Manager	ERM	BSc (honours)	9

Team	Name	Role	Organisation	Academic Experience	Years' Experience
Project Management Team	Becky Summons	EIA Consultant	ERM	MSc	7
EIA and EMP Technical Team	Piers Touzel	SIA Consultant	ERM	MBA	16
EIA and EMP Technical Team	Nicci Ng	GIS Specialist	ERM	MSc	8
EIA and EMP Technical Team	Myat Mon Swe	Local Specialist	E Guard	M.Eng.	10

2.5 REPORT STRUCTURE

The remainder of this EIA Report is structured as follows:

- Section 3: the institutional framework for the Project.
- Section 4: the Project description and alternatives selection.
- Section 5: the environmental and social baseline.
- Section 6: the impact assessment including the adopted methodology and proposed mitigation measures, as well as the cumulative impact assessment (CIA).
- Section 8: the Project's public consultation and disclosure activities.
- Section 9: the conclusions of the EIA Report and recommendations of future actions.

A separate EMP has been prepared for the Project to accompany the submission of this EIA Report.

3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This section provides the relevant legal and policy context in Myanmar including the following:

- Woodside's corporate policies relating to health, safety and the environment.
- Policy and Legal Framework; including:
  - Myanmar EIA legislation, other relevant Myanmar legislation; and
  - International conventions, standards and guidelines relevant to the Project.
- Institutional Framework of the Project Proponent and Myanmar; including the requirements of the Production Sharing Contract (PSC).
- Environmental and/or health standards related to the Project.

3.1 CORPORATE POLICIES

Woodside has adopted comprehensive Health, Safety, Environment and Quality and Sustainable Communities Policies. The objectives and principles of these policies are outlined in ***Annex 3.1***.

3.2 POLICY AND LEGAL FRAMEWORK

3.2.1 Myanmar EIA Procedure

The EIA Procedure set out the requirements for development, assessment and subsequent monitoring of an EIA. The requirements to conduct an EIA are outlined in the Environment Conservation Law (2012) and Environment Conservation Rules (2014). The EIA Procedure is supported by the draft Administrative Instruction which sets out a proposed format and content for reports.

The full EIA Process undertaken for the Project is shown in *Figure 3.1*. The Project is currently in the EIA Investigation and Reporting Phase which is discussed in detail below.

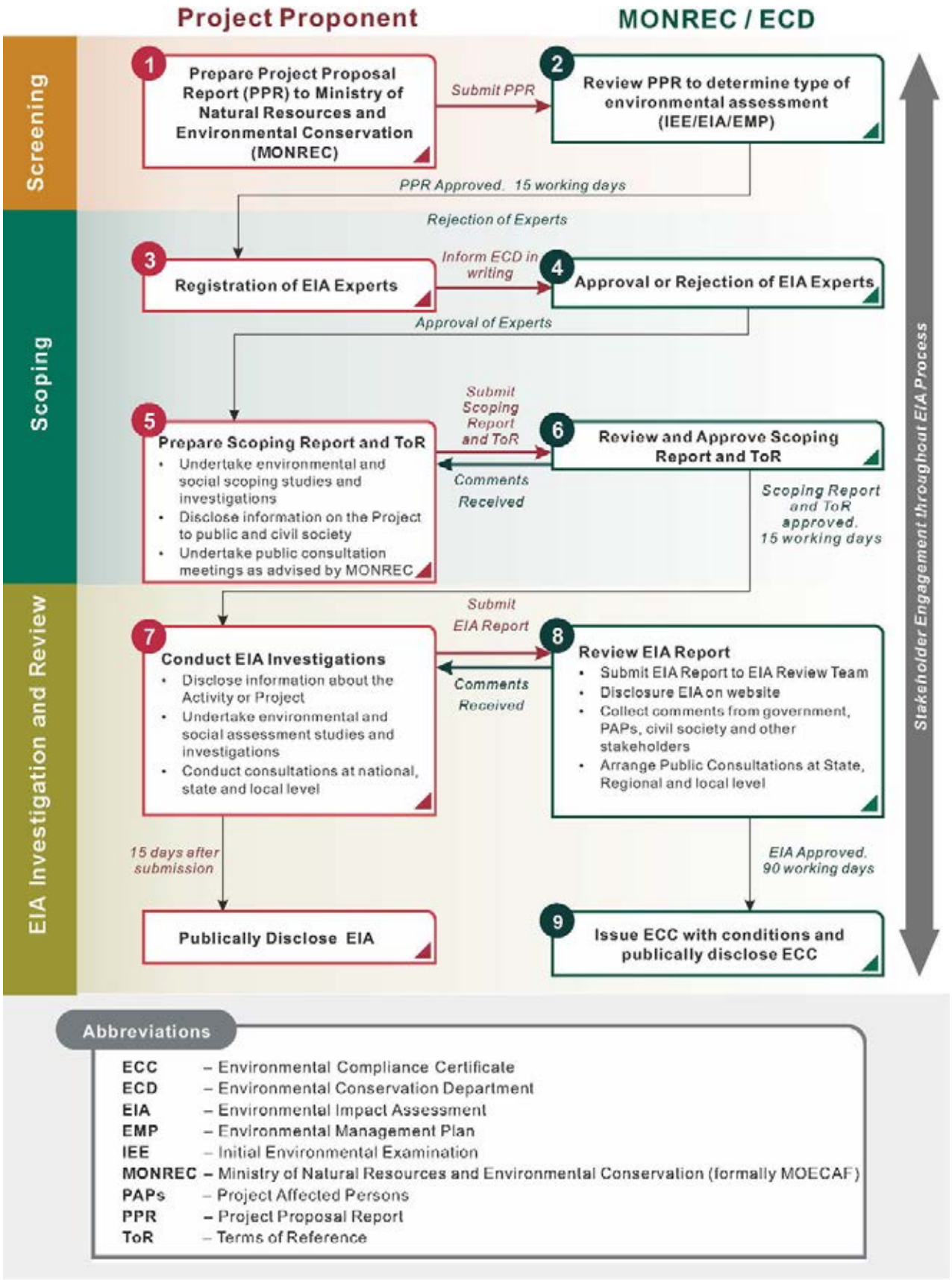


Figure 3.1 EIA Process in Myanmar

Woodside has undertaken a systematic assessment of the Project activities. Screening was conducted as part of the assessment to identify all potential environmental and social risks. A summary of the screening and the preliminary identified environmental and social impacts was submitted to MONREC (via MOGE) in the form of a PPR in August 2016. MONREC used this document to decide what level of assessment would be required. An EIA Study was required in line with Annex I of the EIA Procedure for the Project.

After screening, a Scoping Phase was conducted to further identify the potential impacts of the Project, and potentially Project Affected Peoples (PAPs) / Communities and to identify potential mitigation measures. Stakeholder engagement was undertaken during this process to collect baseline data and allow stakeholders to express views and concerns which would be considered during the EIA Phase. The Scoping Report contained the Terms of Reference for the EIA Report which outlined the scope and studies necessary as part of the EIA Phase. This Scoping Report and Terms of Reference were also submitted to MONREC (via MOGE) on 7 September 2016.

The subsequent EIA Report (this Report) has been prepared to address potential adverse environmental and social impacts and propose appropriate mitigation measures. The report includes the results of public consultations and addresses public concerns when assessing impacts, designing mitigation measures and selecting monitoring parameters. This EIA report will be submitted to MONREC (via MOGE).

The EIA Procedure states that operators should disclose the EIA Report to civil society, PAPs, concerned government organisations and other interested stakeholders. This EIA Report will be disclosed to the public by distributing an executive summary in Myanmar to the General Administration Department (GAD) and Department of Fisheries (DoF) offices in Pathein, advertising the availability of the report for review in a national newspaper and providing access to both the English and Myanmar language executive summary and full English report on Woodside's website.

3.2.2 Myanmar Legislation Relevant to the Proposed Project

Laws relating to environmental and social issues within the oil and gas sector and hence their relevant relevance to the EIA Study for the Project are included in *Table 3.1*.

Table 3.1 Myanmar Legislation Relating to the Oil and Gas Sector and Relevance to the Proposed Project

Legislation	Relevance to the project
Environmental Conservation Law, March, 2012 (No. 9/ 2012)	The project shall carry out an environmental impact assessment, a social impact assessment and prepare an environmental management plan.
Environmental Conservation Rules, June, 2014	
EIA Procedure	The EIA of the project complies with the procedure
NEQ Guidelines	The project shall consider emissions standards in its environment impact assessment an environmental management plan.
Draft EIA Administrative Guidance, 2015	Provides the order and structure of the report.
Foreign Investment Law, November, 2012	The project shall obtain relevant government permissions.
Foreign Investment Rules, January, 2013	

Legislation	Relevance to the project
The Protection Of Wildlife And Conservation Of Natural Areas Law, 1994 (No. 6/94)	The project shall not cause unacceptable impacts to protected habitats and species.
Rules On Protection Of Wildlife, And Protected Area Conservation Law (2003) And The Protection Of Wildlife, And Wild Plant And Conservation Of Natural Areas Rules (2002)	
Union Of Myanmar Marine Fisheries Law, 1990 (Amended In 1993)	The project shall not cause water pollution and shall not cause unacceptable disturbance to fishes and other marine organisms.
The Law Relating to Aquaculture, 1989	Not directly relevant to project as no aquaculture exists within or near to A-6.
The Law Relating to the Fishing Rights of Foreign Fishing Vessels, 1989	Not directly relevant to the project. Relevant to foreign fisheries.
The Oil Fields Act, 1918	Not directly relevant to the project. Relevant to government.
The Petroleum Act 1934 (The State Peace and Development Council Law No. 33/ 2010)	Not directly relevant to the Project as no production, storage or transportation of oil.
The Petroleum Rules (1937)	
Territorial Sea and Maritime Zones Law 1977 (Law No. 3)	Not directly relevant to the Project. Relevant to government.
The Law Amending The Territorial Sea And Maritime Zone Law (2008)	Not directly relevant to the project. Relevant to government.
The Law Amending The Ports Act 2008 (The State Peace And Development Council Law No. 5/2008)	No ballast, rubbish or other wastes will be discharged at Myanmar ports.
Myanmar Port Authority Law 2015	Project vessels may potentially use the Thaketa supply base in Yangon.
The Inland Navigation Vessel Law 2015	Project vessels may potentially use the Thaketa supply base in Yangon.
Prevention From Danger Of Chemical And Associated Material Law (26th august 2013)	Low toxicity chemicals will be selected where possible for use during drilling.
The Burma Wildlife Protection Act 1936	Not directly relevant to project as no sanctuaries within or near to A-6.
The Burma Wildlife Protection Rules 1941 (Burma Act No. Vii Of 1936)	
The Protection And Preservation Of Cultural Heritage Region Law 1998 (The State Peace And Development Council Law No. 9/98)	No cultural heritage sites within or near A-6.
The Conservation of Antique Objects law 2016	No cultural heritage sites or identified antique objects within or near A-6.
The Conservation Of Water Resources And Rivers Law, October, 2006 (The State Peace And Development Council Law No. 8/2006)	Not directly relevant to project as no rivers are near to A-6 and no impact anticipated on water resources.
The Law On Standardization (2014)	Not directly relevant to the project. Relevant to government.
National Sustainable Development Strategy (2009)	Project aligns with principles of environmental and social impact assessment procedure.
National Environmental Policy (1994)	Not directly relevant to the project. Relevant to government.
Myanmar Insurance Law (1993)	Relevant to insurance matters for the project.

Legislation	Relevance to the project
Myanmar Agenda 21 (1997)	Relevant to sustainability goals for the project.
Settlement of Labour Dispute Law, 2012	Project aligns with law to ensure the rights of all workers are upheld.
The Union of Myanmar Public Health Law, 1972	Project aligns with law to safeguard public health.

3.2.3 International Agreements and Conventions

Relevant international conventions to which Myanmar is a signatory include those related to waste management, biodiversity conservation and labour conventions. The key international conventions of relevance to the Project are included in *Table 3.2*.

Table 3.2 International Conventions of Relevance to the Proposed Project

Legislation	Description	Relevance to the Project	Ratification Status
Environmental			
The International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997(MARPOL)	Regulates waste, emission and discharges from vessels. Contains the following Annexes: Annex I: Regulations for the Prevention of Pollution by Oil (October 1983) Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (1986) Annex III: Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (1992) Annex IV: Regulations for the Prevention of Pollution by Sewage from Ships (September 2003) Annex V: Regulations for the Control of Pollution by Garbage from Ships (December 1998) Annex VI: Regulations for the Prevention of Air Pollution from Ships (1997)	The Project vessels will comply with emissions and discharge standards. Annex I, IV, V and VI are or relevance to the Project.	Ratified Annexes I to V
Vienna Convention for the Protection of the Ozone Layer 1988 and Montreal Protocol on Substances that Deplete the Ozone Layer 1989	Aims at the protection of the ozone layer, including requirements for limiting the production and use of ozone depleting substances.	Project vessels will comply where relevant.	Accession 16 Sep 1998 (Vienna) & Accession 24 Nov 1993 (Montreal)
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (CMS)	CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. Myanmar is currently a non-party but is a MOU Signatory for two CMS instruments: IOSEA Marine Turtles and dugongs.	The Project will be undertaken in offshore habitats which potentially have marine turtle species. Dugongs are coastal and unlikely to be impacted by Project activities.	Marine Turtle (2001) & dugong (2007)
Convention on Biological Diversity 1992	Aims to promote national policies for the conservation of wild flora, fauna and habitat that needs to be included in planning policies. The three main goals are: (1) the conservation of the biological diversity; (2) the sustainable use of its components; (3) fair and equitable sharing of the benefits.	The Project will be undertaken in offshore habitats.	Ratified 25 Nov 1994
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	The Convention regulates the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner.	The Project may generate hazardous wastes.	Entered into force 6 April 2015

Legislation	Description	Relevance to the Project	Ratification Status
United Nations Framework Convention on Climate Change 1992 (UNFCCC) and Kyoto Protocol 1997	Provide a framework for intergovernmental efforts to tackle climate change. Recognises that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other GHGs.	The Project will form part of Myanmar's total emissions output.	Entered in force 23 Feb 1995 (UNFCCC) and 16 Feb 2005 (Kyoto Protocol)
Asia Least Cost Greenhouse Gas (GHG) Abatement Strategy (ALGAS) 1998	Develop national and regional capacity for preparation of GHG inventories. Assist in identifying GHG abatement options and preparation of a portfolio of abatement projects for each country.	The project will produce air emissions from the vessels.	1998
United Nations Agenda 21	Formed by the National Commission for Environmental Affairs in Myanmar. Provides a framework of programmes and actions for achieving sustainable development in the country. Building on the National Environment Policy of Myanmar, takes into account principles contained in the Global Agenda 21. Myanmar Agenda 21 also aims at strengthening and promoting systematic environmental management in the country.	Not relevant to Project. Relevant to government.	Since 1997
Social			
The International Convention for the Safety of Life at Sea (SOLAS) 1974	Ensures that ships flagged by signatory States comply with minimum safety standards in construction, equipment and operation.	The Project vessels will comply with safety standards (as applicable or required by vessel class).	Entered into Force 11 Feb 1988
Convention on the International Regulations for Preventing Collisions at Sea (COLREG) 1972	Sets out the navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels.	The Project vessels will comply with navigation rules (as applicable or required by vessel class).	Entered into Force 11 Nov 1987
International Convention on Standards of Training, Certification and Watch-keeping for Seafarers 1978	Sets out requirements for marine environment awareness training and training in leadership and teamwork including new training guidance for personnel operating Dynamic Positioning Systems.	The project vessels will comply with training requirements (as applicable or required by vessel class.	Entered into Force 1988

3.2.4 International Guidelines

Woodside has undertaken the impact assessment study and offshore drilling activities in a manner which is guided by good practice. Applicable guidelines which have been considered include:

- IFC Performance Standards (IFC PS) (2012): The IFC PS's represent the 'policy framework' for the EIA and sustainable social and environmental management for the Project, whereas the World Bank Group's Environmental, Health, and Safety (EHS) Guidelines provide guidance on general and industry best practice as well as recommended numerical limits for emissions to the atmosphere, noise, liquid and solid wastes, hazardous wastes, health and safety, and other aspects of industrial facilities and other types of development projects.
- World Bank Group EHS General Guidelines (2007): The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.
- IFC EHS Guidelines for Offshore Oil and Gas Development (2007 & updated 2015): The EHS Guidelines for Offshore Oil and Gas Development include information relevant to seismic exploration, exploratory and production drilling, development and production activities, offshore pipeline operations, offshore transportation, tanker loading and unloading, ancillary and support operations, and decommissioning. The guidelines also address potential onshore impacts that may result from offshore oil and gas activities. These latest guidelines for offshore oil and gas development (June 2015) consider industry-specific impacts and management relevant to the environment, occupational health and safety and community health and safety, as well as the development of performance indicators and monitoring programs. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of the environmental and social assessment.
- United Nations Environment Program (UNEP) Guidelines on Environmental Management for Oil and Gas Exploration and Production (1997): This document provides an overview of the environmental issues and the technical and management approaches to achieving high environmental performance in the activities necessary for oil and gas exploration and production.

Other good practice guidelines from organisations such as the International Maritime Organisation (IMO), American Petroleum Institute (API), International Petroleum Industry Environmental Conservation Association (IPIECA), International Association of Oil and Gas Producers (IOGP) and International Association of Geophysical Contractors that have been considered for the Project include:

- IPIECA: The Oil Gas Industry: Operating in Sensitive Environments (2003).
- IOGP: Environmental management in oil and gas exploration and production (1997).
- IOGP: Environmental Fates and Effects of Ocean Discharge of Drill Cuttings and Associated Drilling Fluids from Offshore Oil and Gas Operations (2016).
- API: The API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and. Natural Gas Industry (2009).

3.3 INSTITUTIONAL FRAMEWORK OF THE PROJECT PROPONENT AND MYANMAR GOVERNMENT

3.3.1 Myanmar Regulatory Authorities

Matters pertaining to Health, Safety and Environment (HSE) requirements are generally under the jurisdiction of the ministries and state-owned enterprises in the oil and gas sector. Key ministries, agencies and state-owned enterprises that have jurisdiction over HSE matters in oil and gas operations are included in *Table 3.3*.

Table 3.3 Key Ministries, Agencies and State-Owned Enterprises Involved in HSE

Ministry/agency	Responsibility
MONREC	MONREC has ultimate responsibility in the approval, or otherwise, of submissions under the EIA Procedure.
ECD	The ECD of MONREC has responsibility to undertake the review of submissions under the EIA Procedure and provide recommendations to the Minister of MONREC
MOGE	MOGE is the state-owned enterprise responsible for working together with oil and gas companies (local and international) in Myanmar and oversees the PSCs in cooperation with foreign oil companies. MOGE is involved in direct communication and coordination with various levels of different government agencies for HSE related issues.
Ministry of Electricity and Energy (MOEE)	MOEE jointly works with MOGE in managing HSE issues of oil and gas operators in Myanmar, in which MOEE encourages operators to establish a HSE Management System and prepare their own EIA for their project.
Myanmar Investment Commission (MIC)	MIC is a government agency responsible for coordinating with ministries (such as the MOEE) and other state entities to facilitate foreign investment in Myanmar. The MIC is also responsible for granting MIC permits which enable foreign investors to carry out business activities under the Foreign Investment Law (1998). The Law specifies MIC shall "*take consideration on the facts such as financial credibility, economic justification of the business, appropriateness of technology and protection and conservation of environment in scrutinizing the proposals of investment*".

Fisheries Organizations

Fisheries organisations are of relevance to the Project due to the offshore nature of the works. The key organisations involved in the governance of the fisheries sector are discussed in the section below.

Department of Fisheries

The DoF, under the Ministry of Agriculture, Livestock and Irrigation, is the main institutional body which governs fishing grounds, methods and catches. The DoF is responsible for the development of the fisheries sector and management of commercial fisheries including exports. There are also fisheries administrations within the States and Regions of Myanmar, including Ayeyarwady Region.

The DoF is responsible for:

- Issuing of fisheries licenses for gear/vessels/sites and aquaculture sites/ventures.
- Advising the Ministry of Agriculture, Livestock and Irrigation and the State Government on fisheries and aquaculture matters.
- Acting as regulatory body for the correct and proper conduct of fisheries and aquaculture.
- Facilitating the technical needs and equipment of the marine sector.
- Undertaking research and development activities.

Myanmar Fisheries Federation

The Myanmar Fisheries Federation (MFF) was formed in 1998 from the Myanmar Fishery Association, as part of the Association of South-East Asia Nations (ASEAN) Fisheries Federation. It is a non-governmental organisation (NGO) that deals with the fisheries industries.

The MFF operates at a local and national level and is governed by a Central Executive Committee. The Central Executive Committee plays a coordinating role and is supported by office holders. The role of the MFF is to:

- Support applications made by its members to DoF for the fisheries and aquaculture licenses.
- Support applications to the Livestock and Fisheries Bank for loans.
- Raise issues of importance to their members with the DoF.
- Assist in the negotiation of selling and harvesting.
- Assist in the transferring of technology to farmers.
- Assist in the communication and cooperation with trans-boundary organizations.

3.3.2 Production Sharing Contract Requirements

The PSC between MOGE and the JV contains governing conditions for the Project and notes that the Project shall be undertaken in accordance with the laws, regulations and directives of Myanmar, specifically the PSC states that the JV shall conduct operations in a "*work-man like manner and by appropriate scientific methods*" and take "*precautions for protection of navigation and fishing and the prevention of environmental pollution as are consistent with international oilfield practices*".

3.4 ENVIRONMENTAL AND SOCIAL STANDARDS

With the promulgation of the EIA Procedure in December 2015, the NEQ Guidelines were also enacted. These Guidelines provide the basis for regulation and control of noise and air emissions and effluent discharges from projects in order to prevent pollution and protect the environment and public health. The NEQ Guidelines is noted to be the same as that recommended by the IFC General EHS Guidelines (2007) (6) and the IFC sector specific guidelines (7). The NEQ Guideline reference the IFC sector specific 2007 offshore oil and gas guidelines. The sector specific guidelines for offshore oil and gas were updated in June 2015.

A summary of Myanmar national environmental standards referencing 2007 IFC offshore oil and gas guidelines and the 2015 IFC offshore oil and gas guidelines that are relevant to the Project (drilling) for effluent discharges are shown in *Table 3.4*.

(6) Environmental, Health and Safety (EHS) Guidelines – General EHS Guidelines: April 2007, International Finance Corporation, World Bank Group

(7) World Bank Group (2015) International Finance Corporation Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development. June 5, 2015. Available online at: **http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines**

Table 3.4 National Environmental Quality (Emissions) Guidelines on Effluent Discharge Levels

Parameter	National Environmental Quality Guideline based on 2007 IFC offshore oil and gas guidelines with 2015 IFC offshore oil and gas guidelines noted
Drilling fluids and cuttings (non-aqueous drilling fluid)	Non-aqueous drilling fluid, re-inject or ship-to-shore; no discharge to sea Drilled cuttings, re-inject or ship-to-shore; no discharge except: • Oil concentration lower than 1% by weight on dry cuttings • Mercury maximum 1 milligram per kilogram (mg/kg) dry weight in stock barite • Cadmium maximum 3 mg/kg dry weight in stock barite • Discharge via a caisson at least 15 m below sea surface 2015 change Non Aqueous drilling fluid: Reinject or ship-to-shore, no discharge to sea 2) Drilled cuttings: Reinject or ship-to-shore, no discharge to sea except: • Facilities located beyond 3 miles (4.8 km) from shore; • For new facilities: Organic Phase Drilling Fluid [a], concentration lower than 1% by weight on dry cuttings [b]; • For existing facilities [c]: Use of Group III non-aqueous base fluids and treatment in cutting dryers. Maximum residual Non Aqueous Phase Drilling Fluid [d] (NAF) 6.9% (C16 -C18 internal olefins) or 9.4% (C12-C14 ester or C8 esters) on wet cuttings; • Discharge via a caisson (at least 15 m below surface is recommended whenever applicable; in any case, a good dispersion of the solids on the seabed should be demonstrated)
Drilling fluids and cuttings (water-based drilling fluid)	Water-based drilling fluid, re-inject or ship-to- shore; no discharge to sea Water-based drilling fluids and cuttings, re-inject or ship-to-shore; no discharge to sea except: • Mercury 1 mg/kg dry weight in stock barite • Cadmium 3 mg/kg dry weight in stock barite • Maximum chloride concentration must be less than four time's ambient concentration of fresh or brackish receiving water • Discharge via a caisson at least 15 m below sea surface 2015 change 1) Water Based Drilling Fluid (WBDF): Reinject or ship-to-shore, no discharge to sea except: • In compliance with 96 hr. LC-50 of Suspended Particulate Phase (SPP)-3% vol. toxicity test first for drilling fluids or alternatively testing based on standard toxicity assessment species [e] (preferably site-specific species) WBDF cuttings: Reinject or ship-to-shore, no discharge to sea except: • Facilities located beyond 3 miles (4.8 km) from shore; Discharge via a caisson (at least 15 m below sea surface is recommended whenever applicable; in any case, a good dispersion of the solids on the seabed should be demonstrated)

Parameter	National Environmental Quality Guideline based on 2007 IFC offshore oil and gas guidelines with 2015 IFC offshore oil and gas guidelines noted
Completion and well work-over fluids	Ship-to-shore or re-inject, no discharge to sea except: • Maximum one day oil and grease discharge • should not exceed 42 milligrams per litre (mg/L); 30 day average should not exceed 29 mg/L • Neutralise to attain a pH of 5 [f] or more 2015 Change Oil and grease content does not exceed 42 mg/L daily maximum; 29 mg/L monthly average
Hydrotest water	Send to shore for treatment and disposal Discharge offshore following environmental risk analysis, careful selection of chemicals Reduce use of chemicals [g]
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 m from point of discharge
Desalination brine	Mix with other discharge waste streams if feasible
Sewage	Compliance with MARPOL 73/78 [h] (as applicable or required by vessel class)
Food waste	Compliance with MARPOL 73/78 [h] (as applicable or required by vessel class)
Storage displacement water	Compliance with MARPOL 73/78 [h] (as applicable or required by vessel class)
Bilgewater	Compliance with MARPOL 73/78 [h] (as applicable or required by vessel class)
Deck drainage	Compliance with MARPOL 73/78 [h] (as applicable or required by vessel class)

a: New facilities include offshore drilling rigs which have been newly designed or structurally modified for the project.

b: As defined by OSPAR (2000) Decision 2000/3.

c: Applicable to existing offshore drilling rigs deployed for development well drilling programs. Applicable to exploratory well drilling programs. Technically and financially feasible techniques, including installation of thermo-mechanical cutting cleaning systems, to meet the guidelines for new facilities should be considered for implementation, in relation to the number of wells (including producers and injectors) included in development drilling programs, and/or to potential impacts on critical habitats.

d: As defined in US EPA (2013a).

e: 96-hr LC-50: Concentration in parts per million or percent of the SPP from sample that is lethal to 50 percent of the test organism exposed to that concentration for a continuous period of 96 hours. See also: http://www.epa.gov/nrmrl/std/qsar/TEST-user-guide-v41.pdf.

f: Standard Unit

g: In accordance with OSPAR (2010a) “Recommendation 2010/4 on a Harmonised Pre-screening Scheme for Offshore Chemicals” or other applicable process

h: In nearshore waters, carefully select discharge location based on environmental sensitivities and assimilative capacity of receiving waters.

This EIA Report assesses proposed discharge standards for the Project against the NEQ Guidelines and IFC 2015 (8). Proposed discharge standards are also included in the EMP.

(8) World Bank Group (2015) International Finance Corporation Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development. June 5, 2015. Available online at: **http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines**

4 PROJECT DESCRIPTION AND ALTERNATIVES SELECTION

4.1 PROPOSED PROJECT ACTIVITIES

4.1.1 Project Background

Woodside, on behalf of the JV (see *Table 1.1*), is proposing to undertake a drilling program in A-6 commencing in 2017 (*Figure 1.1*). The Project covers a proposed drilling program of up to six wells over the period 2017-2019, although not all of these wells may be drilled.

The 2017 program will include up to two wells, one of which is a firm well and one of which is optional. Depending on the outcome from the 2017 drilling, and subject to decisions by the A-6 JV, an additional four wells may be drilled during 2018 and 2019.

In 2013, Woodside entered a farm-in agreement with MPRL E&P with respect to A-6 in the Rakhine Basin. In 2015, Total E&P farmed in to A-6. Woodside, Total E&P and MPRL E&P hold 40%, 40% and 20% interests respectively in A-6 (the JV). Woodside is a joint operator. The first stage of the Project was screening which included the submission of the PPR to MOGE (for onward submission to MONREC) which was prepared and submitted in June 2016. Following this, the ECD of MONREC responded to the PPR in writing in August 2016, instructing Woodside to undertake an EIA for the proposed drilling activities. Woodside then prepared and submitted a Scoping Report which included the Terms of Reference for the EIA Study. This was submitted to MOGE on the 7 September 2016.

4.1.2 Project Location and Project Area

At its closest point the Project Area is about 21 miles (35 km) from the Myanmar coastline (the 35 km delimitation within A-6 is hereafter termed the “Project Area”) (*Figure 4.1*). Water depths in A-6 range from shallow coastal waters to offshore open waters of up to about 7870 ft (2400 m).

The well locations will be determined from the interpretation of seismic data. If it is determined that additional wells will be required in 2018 and 2019, the results from the 2017 program will inform the location of the wells.

The locations of the wells are not yet finalised. The one firm well and one optional well to be drilled in 2017, as well as those potentially drilled in the 2018–2019 period, will be located in the Project Area of A-6, which is about 21 miles (35 km) from the Myanmar coastline. The wells will be drilled using a Mobile Offshore Drilling Unit (MODU) which will have a safety, or exclusion area, of 1640 ft (500 m) radius. The total area temporarily excluded from other marine users at each well is about 2625 square ft (0.8 square kilometres (km^2)).

4.1.3 Project Scale

For this Project, it is assumed that during 2017, the non-continuous operations will occur over a period of three to six months (depending on whether contingent operations become firm). The average number of personnel employed during operations will be about 200. As the drilling is not for production purposes, a production rate is not relevant to this Project. It is estimated that the expenditure on the Project will be in the range of USD$80–110 million for the 2017 drilling program [9].

(9) Costs are indicative only and include direct and indirect costs.

4.1.4 Proposed Project Schedule

The wells are anticipated to take about 60 days in total each to drill. The drilling will be conducted for 24 hours a day. There is also the potential for a drill stem test to be undertaken if gas is discovered.

The actual volume and duration of well testing are both subject to the outcomes of drilling, and will be minimised to the extent possible. Drill stem testing may be carried out on one or two wells, and the associated flaring is expected to take about 20 days in total. Drilling will be undertaken one well at a time. Depending on the outcome, an additional four wells may be drilled in 2018 and 2019 however; this has not yet been determined by the JV. The well locations for the 2017 program are being identified based on subsurface information from the 2013 and 2015 seismic data which is under review. Geophysical and geohazard data as well as seabed baseline conditions are some of the other inputs considered in determining a well location. The results of the proposed 2017 drilling program will be analysed and considered in the planning and location of any subsequent wells. Woodside applies a well lifecycle management process for all wells. This process is consistent with international standards and covers all aspects of design and construction, from specification of the basis of design through to well suspension or abandonment. An image of the oil and gas lifecycle is provided in *Figure 4.2*. The A-6 drilling program is in the Acquire and Explore Phase in which Woodside is identifying and proving the presence and value of hydrocarbons. A Project timeline is provided in *Table 4.1.*

4.1.5 Project Activities

Drilling Activities

The design and drilling of exploration and appraisal wells are identical. The only difference between them is the purpose for which they are drilled. Exploration wells are drilled in a location in which a hydrocarbon reservoir may potentially exist. Appraisal wells are drilled to appraise the extent and characteristics of a hydrocarbon reservoir that is encountered. A typical well will be drilled to a total depth ranging from 6560 ft (2000 m) to 8200 ft (2500 m) (total vertical depth in metres below sea bed). Top-hole sections will be drilled riser-less using seawater and WBDF to circulate drill cuttings from the wellbore, which are released to the seabed. The initial top-hole section will either be jetted or drilled using seawater and a conductor (i.e. steel tubular casing) will be run and cemented in place. Cementing operations provide structural support for the well. After the conductor is set, further top-hole drilling takes place with WBDF and cuttings are released to the seabed. The top-hole section will then be cased with surface casing and a high pressure wellhead housing installed. Surface casing will be cemented in place.

After completion of the top-hole section a blowout preventer (BOP) and marine riser is installed on the wellhead. The BOP is required for well control and a marine riser acts as a conduit between the wellhead and MODU.

Once the riser is in place the bottom-hole sections will be drilled using NADF. The riser enables a closed circulation drilling fluid system to be maintained whereby drilling fluids and cuttings from the well are returned back to the MODU for separation. Equipment on the MODU separates the NADF which is reused, from the cuttings which are treated for disposal.

A schematic of a typical well is provided in *Figure 4.3* and a summary of a typical well is provided in *Table 4.2.*

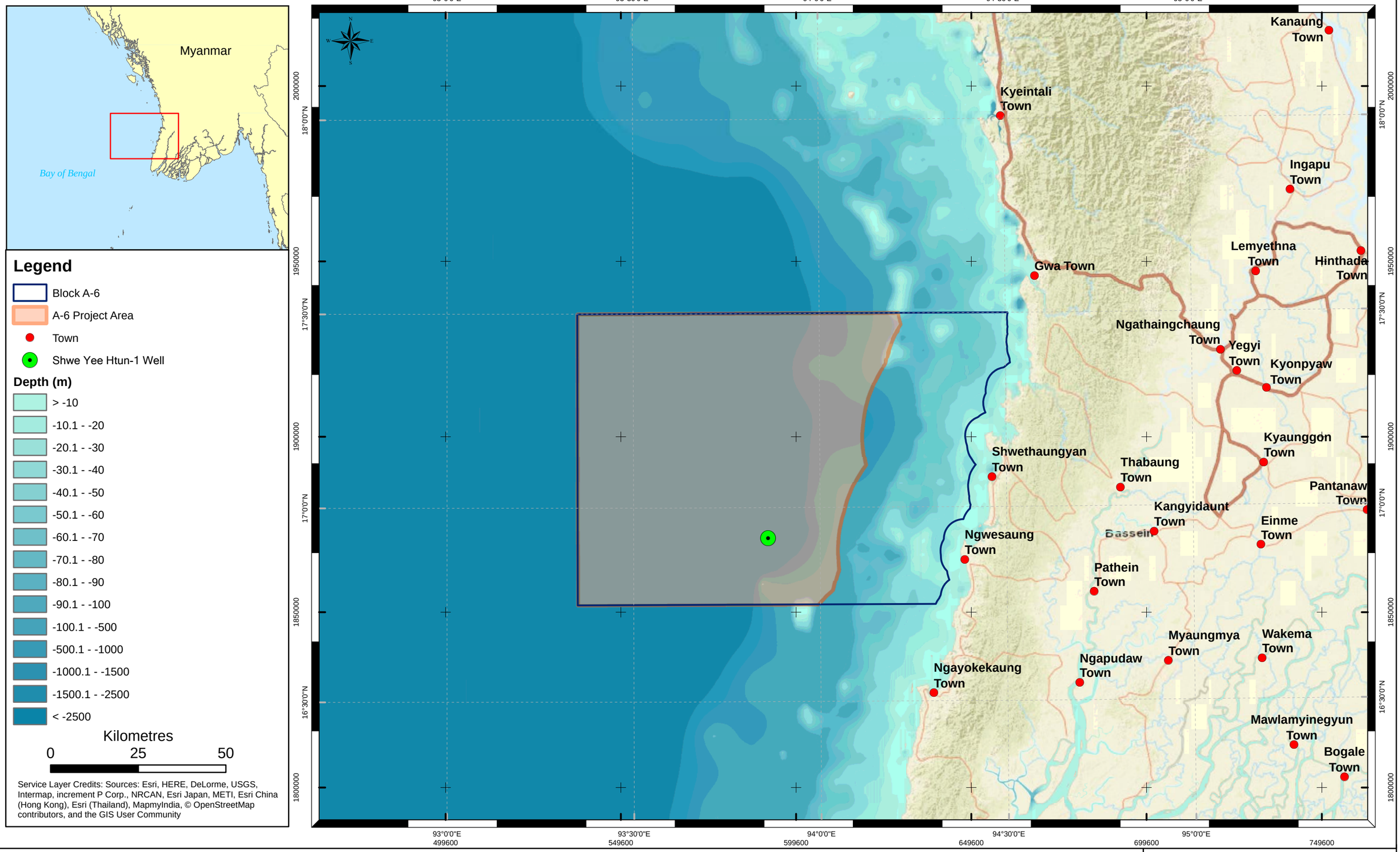


Figure 4.1

Location of A-6 and Project Area

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Date: 30/9/2016

Environmental Resources Management

ERM

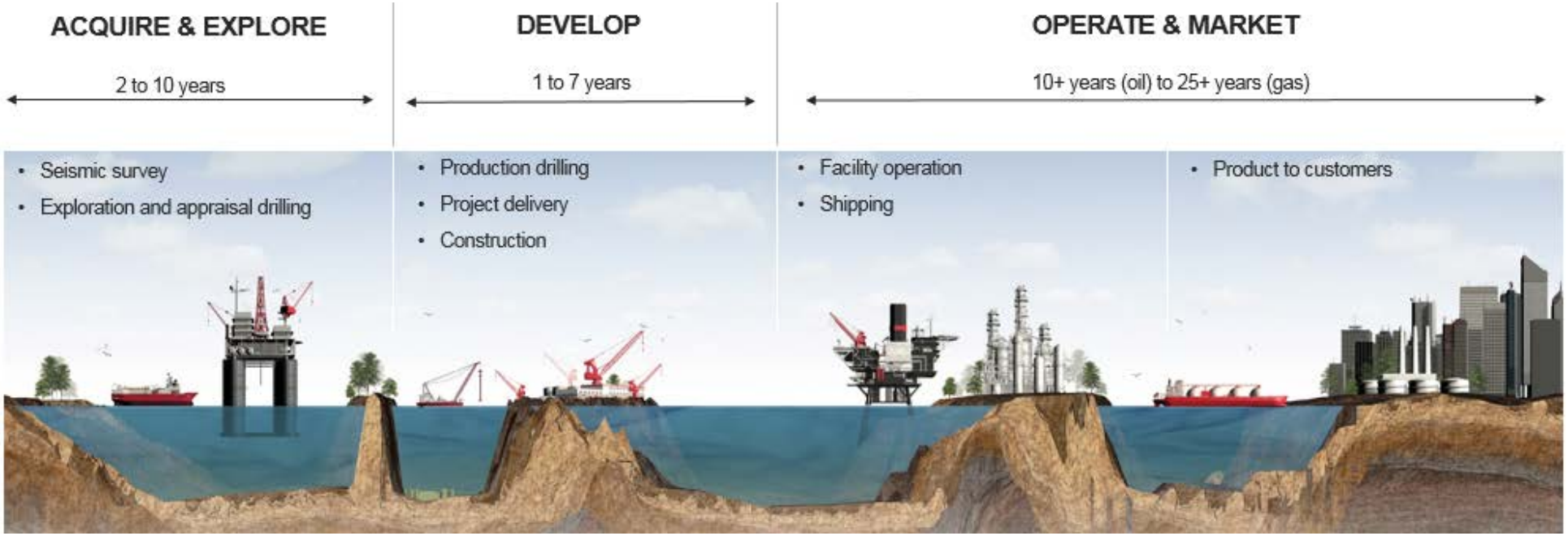


Figure 4.2 Indicative Oil and Gas Lifecycle

Table 4.1 Indicative Proposed Project Timeline

Task	2016				2017				2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Project Planning	X	X	X	X												
Environmental Approvals		X	X	X	X											
2017 Drilling Program						X	X	X								
Potential 2018 drilling program*											X	X				
Potential 2019 drilling program*															X	X

** Drilling in 2018 and 2019 depends on the outcome from 2017 drilling and is yet to be decided by the JV. Dates are indicative only.*

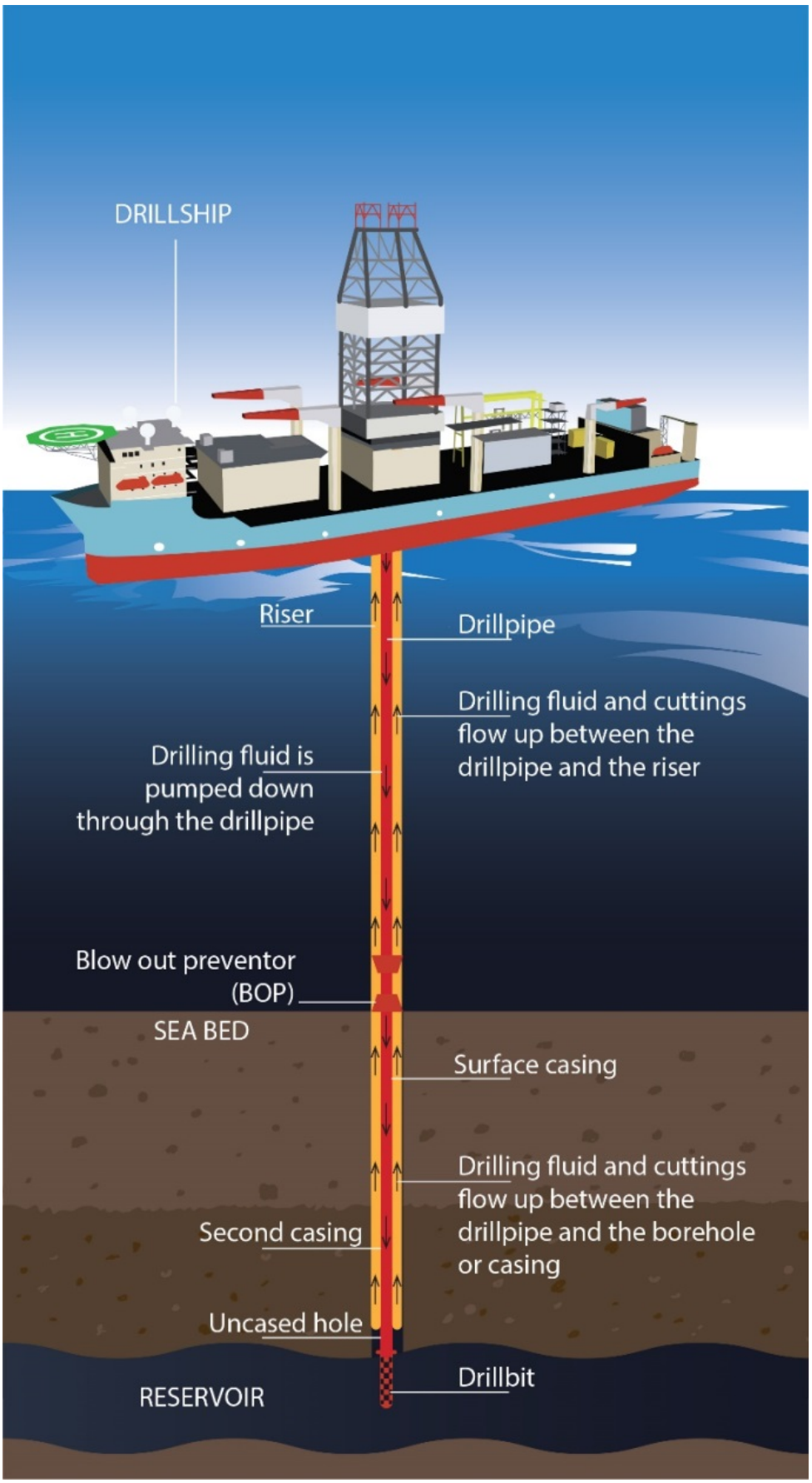


Figure 4.3 Drilling Well Overview Diagram

Table 4.2 Typical Well Summary

Well Section	Drill Fluid Type	Hole outer diameter (inches)	Section Length (m) Shallower Well	Section Length (m) Deeper Well	Location of Discharge
Top hole	Seawater	42”	72	72	Discharged at seabed
	WBDF	26”	N/A	1000	Discharged at seabed
Bottom hole	WBDF	17½”	1000	N/A	Discharged at seabed
	NADF	17½”	N/A	700	Returned to MODU for separation
	NADF	12¼"	700	500	Returned to MODU for separation
	NADF	8½"	200	400	Returned to MODU for separation
Total Depth from Sea Bed			**2000**	**2700**	

Formation Evaluation

While drilling through the reservoir, full diameter cores may be recovered. Coring is a way of cutting a cylindrical sample of rock in about 30 m intervals and recovering the sample to surface for future laboratory testing.

Once the required depth is reached, the well will be evaluated by running a series of wireline logs. Wireline logs take a series of measurements from inside the wellbore. These measurements are used to characterise formation properties and hydrocarbon presence. Wireline reservoir sampling may be undertaken to collect in-situ reservoir fluids downhole at reservoir conditions. These fluid samples are recovered to surface for future analysis.

If required, wireline logs may include vertical seismic profiling (VSP). VSP utilises a sound source, suspended in the water column, and recorders, located down hole, to provide a high-resolution seismic image of the immediate vicinity of the well. This process is repeated with receivers at different positions in the wellbore and will involve about ten hours of source release within a 24 hour period per well.

Drill Stem Testing

If formation evaluation results indicate the presence of a significant hydrocarbon reservoir, further reservoir analysis may be performed. To understand the hydrocarbon reservoir’s pressure, fluid properties, volume and extent, a drill stem test will be performed. A drill stem test is the controlled production of reservoir fluids to the MODU where they will be flared. All produced reservoir fluids will be combined with a stream of compressed air and then safely and cleanly combusted via burner jets at the end of the burner boom on the rig. The drill stem test flow duration may last for several days. Depending on well test objectives, multiple flow periods may be required. Flaring operations may continue through daylight and night time.

Flaring operations may continue through daylight and night time. The actual volume and duration of well testing are both subject to the outcomes of drilling, and will be minimised to the extent possible. Drill stem testing may be carried out on one or two wells, and the associated intermittent flaring is expected to be approximately 20 days in total. . The total flared volume of gas is expected to be between approximately 600 and 900 million standard cubic feet (MMscf).

Unplanned Drilling Activities

The following are unplanned drilling activities that may be required if operational or technical issues occur during the Project.

There are a number of drilling activities that are not anticipated as part of normal operations in the drilling program, but may be implemented should the operational need arise. These include the potential for a re-spud, side-track, emergency disconnect sequence (EDS), or well suspension. A re-spud may be required if the conductor or well head slumps (typically during top hole drilling).

Re-spudding involves moving the MODU to a suitably close location (e.g. about 50 m from the original location) to recommence drilling, and would result in re-drilling part of the top hole section. A side-track, or an unplanned deviation in drilling direction using the existing top hole section, may also be required if operational issues are encountered. An EDS may be implemented if the MODU is required to rapidly disengage from the well. The EDS closes the BOP and disconnects the riser to break the connection between the wellhead and MODU. Common examples of when this system may be initiated include the movement of the MODU outside of its operating circle or the movement of the MODU to avoid a vessel collision. EDS aims to leave the wellhead in a secure condition but will result in the loss of the drilling fluids/cuttings in the section of the riser from the well head to the MODU following disconnection. During drilling activities, a well may need to be suspended. Suspension involves establishing suitable barriers, removing the riser and disconnecting the MODU from the well. The BOP may sometimes be left in place to act as a barrier. Suspension may be short term (e.g. in the case of a cyclone) or longer term (> one year). On return to a well following suspension the MODU reconnects to the well via the riser, and with the BOP in place, barriers are removed and drilling activity resumes. The environmental aspects of these unplanned drilling activities are the same as those for undertaking the Project and are considered to be adequately addressed by this EIA Report. No significant changes to existing environmental risks or any additional environmental risks are considered likely.

End of Well Activities

On the completion of drilling, formation evaluation and well testing operations, each well will be suspended or plugged and abandoned (P&A), depending on well results and planned future use.

Suspension and P&A activities will be undertaken in accordance with established industry procedures. Well suspension would include installing and verifying temporary barriers to prevent any potential release from the well. P&A activities would include installing and verifying permanent cement barriers to prevent any potential release from the well. Following suspension or P&A, the marine riser and BOP are removed and the MODU is moved to its next location.

This Project consists only of an operations phase. There are no construction or decommissioning related phases. At the end of Project activities, the MODU and all Project vessels will depart the Project Area.

4.2 VESSEL REQUIREMENTS

4.2.1 Mobile Offshore Drilling Unit

A dynamically positioned MODU will be used. A 1640 ft (500 m) exclusion zone will be implemented around the MODU once on site for the duration of drilling in order to prevent any interactions with other marine users (i.e. shipping or fishing activities).

The specific MODU to be used has not yet been confirmed. However, the data provided in *Table 4.3* reflects the general profile for the type of MODU that will be used.

Table 4.3 Typical MODU Details

Component	Specification
Rig type/design/class	Semi-Submersible or Drill Ship
Accommodation	Up to 200 people
Station keeping	Dynamically Positioned
Max drill depth/water depth	9900 – 39,400 ft (3000– 12,000 m)
Length	+/- 656 ft (200 m)
Operating draft	+/- 65 ft (20 m)
Transit draft	+/- 32 ft (10 m)
Bulk mud and cement storage capacity	3300 – 4260 ft (1000 – 1300 cubic metres (m^3))
Liquid mud storage capacity	5250 – 9840 ft (1600 – 3000 m^3)
Fuel oil storage capacity	13,120 – 15,750 ft (4000 – 4800 m^3)
Drill water storage capacity	6560 – 9200 ft (2000 – 2800 m^3)

4.2.2 Support Vessels and Equipment

Drilling operations will be supported by three to four vessels used to transport equipment, fuel, materials and waste between the MODU and the supply base (possibly located in Thaketa, Myanmar, Ranong, Thailand and/or Singapore). Support vessels will not anchor within A-6. Fuel will be transported to the MODU from the support vessels about once a week while at sea (i.e. offshore bunkering). The support vessels will also transfer drilling fluids, base oil, dry bulk materials (barite, gel and cement), and drill water as required and also to collect waste materials, NADF drilling fluids and waste oil from the MODU for appropriate reuse, recycling or disposal via a suitable port and handling facility.

During drilling, a remotely operated vehicle (ROV) is likely to be required to conduct activities close to the seabed including pre-spud visual checks and maintenance on subsea equipment and may also include obtaining seabed samples.

Crew changes will be undertaken via helicopter, most likely from Yangon, and helicopters and other equipment may be re-fuelled on the MODU as required. There will be approximately one to two (up to a maximum of three) round trips per day during drilling operations. Helicopters will transit directly between the airport and the drilling location. When crossing the coastline the helicopters will be at a minimum height of approximately 4000 ft.

4.3 DRILLING SYSTEMS

4.3.1 Drilling Fluids and Chemicals

The function of the drilling fluid is to provide circulation to remove cuttings from the hole, to cool the drill bit and to provide a hydrostatic head exerting a greater pressure than that expected from any formation which may be encountered in order to maintain well control.

Both WBDF and NADF will be used as the drilling fluids for the Project.

WBDF will be used in the upper sections of the well. WBDF drilling fluids will be operationally discharged to the marine environment under the following scenarios:

- At the seabed when drilling the top-hole sections riser-less.

- Operationally discharged from the mud pits from a pipe below the sea surface if the WBDF cannot be re-circulated/re-used through the drilling fluid system, re-used on the well or used on another well; or stored.

WBDF consists of about 92–98% fresh or saline water, with the remaining 2–8% comprised of drilling fluid additives that are generally inert or readily biodegradable organic polymers.

NADF will be used in deeper sections once the marine riser has been installed. NADF drilling fluid is only operationally discharged as oil-on-cuttings following return to the MODU for separation of fluids and cuttings using Solids Control Equipment (SCE) to reduce the residual level of NADF on the drill cuttings prior to discharge below the sea surface.

The NADF drilling fluid will be primarily mixed onshore and transferred to the MODU by a support vessel, where it is stored and maintained in the mud pits. Once NADF cannot be further recycled and reused, disposal down well prior to well plugging and abandonment or onshore disposal may be investigated.

All chemicals that may be discharged to the marine environment during the drilling activity are required to be selected and approved as per the Woodside Chemical Assessment Process and to be in line with all National laws and regulations. Chemicals considered for use are assessed in terms of their application, discharge and potential risk to the marine environment and all approved chemicals are included on the Woodside Master Chemical List. This process is used to demonstrate that the potential risks and impacts of the chemicals selected are As Low As Reasonably Practicable (ALARP) [(10)].

4.3.2 Mud Pits

There are typically a number of mud pits (tanks) on the MODU that provide capacity to mix, maintain and store fluids required for drilling activities. The mud pits form part of the drilling fluid circulation system. The mud pits and associated equipment may be cleaned out between wells and at the end of the drilling program. The mud pit wash residue will be discharged offshore will a volume of less than 1% oil.

4.3.3 Drill Cuttings

Drill cuttings are the broken bits of rock and solid material that are removed from the hole when drilling a well. Cuttings generated from the well are expected to range from very fine to very coarse (<1 centimetre (cm)) particle/sediment sizes. Cuttings from top-hole well sections are discharged at the seabed. The bottom-hole sections of the well will be drilled with a marine riser that enables cuttings and drilling fluid to be circulated back to the MODU, where the cuttings are separated from drilling fluids by the SCE. The SCE uses shale shakers to remove coarse cuttings from the drilling fluid. After processing by the shale shakers, the recovered drilling fluid may be directed to centrifuges, which are used to remove fine solids (4.5 to 6 microns). Separated cuttings are subsequently discharged to sea below the sea surface and the drilling fluid is recirculated for re-use. NADF will be required for drilling of the bottom-hole section of well(s). Discharged NADF cuttings will be limited to 6.9% on average by weight oil on cuttings, after SCE.

(10) As Low As Reasonably Practicable (ALARP) has been defined as an impact that is tolerable only if impact reduction is impracticable or if the effort involved in reducing the impact further would be grossly disproportionate to the benefit gained.

4.4 EMISSIONS, DISCHARGES AND WASTES

4.4.1 Air Emissions from MODU and Vessels

The emission of GHG is unavoidable during the operation of the MODU and vessels. An extensive analysis of the GHG emissions of shipping is presented in the Third IMO Greenhouse Gas Study 2014 (IMO 2014) where a number of factors were developed for the emission of GHGs based on the mass of fuel consumed. It should be noted that both nitrous oxide (N_2O) and methane (CH_4) are GHGs emitted in relatively trace amounts by ships. The principal GHG emitted by internal combustion engines is carbon dioxide (CO_2). Factors for the generation of CO_2 from various fuels are presented in *Table 4.4* and GHG in tons equivalent of CO_2 for the Project are set out in *Table 4.5.*

Table 4.4 Specific Emission Rates of CO_2 for Various Shipping Fuels

Fuel Type	CO_2 Emissions (g/g fuel)
Residual fuel oil (RFO)	3.114
Low sulphur fuel oil (LSFO)	3.114
Marine gas oil (a distillate product) (MGO)	3.206
Liquid natural gas (LNG)	2.750

Table 4.5 Estimated CO_2 Emissions (tonnes)

Vessel	Fuel* Consumed (tonnes)	CO_2 Emission (tonnes)
MODU	7,440	23,853

**fuel estimated as Marine gas oil*

4.4.2 Air Emissions of Flaring

Flaring of gas from the well during testing will also lead to the emission of GHG. The actual volume and duration of well testing are both subject to the outcomes of drilling, and will be minimised to the extent possible. Drill stem testing may be carried out on one or two wells, and the associated intermittent flaring is expected to be approximately 20 days in total. The total flared volume of gas is expected to be between approximately 600 and 900 MMscf.

As with the other combustion sources the principal constituents of flaring emissions for the purpose of calculating GHG will be; CO_2, followed by far lower amounts of CH_4 and N_2O. Emissions of CO_2 and N_2O are formed as products of combustion, and CH_4 emissions may result from incomplete combustion [11].

The emission of GHG from flaring has been estimated using the Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industry (the Compendium) (August 2009), as produced by API. The Compendium provides a detailed methodology and wide range of emission factors and is used as a common reference document for calculating GHG emissions from the oil and gas industry. The NEQ Guidelines do not specify GHG emission methodologies and as such, this Compendium has been used as an example of good international industry practice. It is important to note that the actual emissions from flaring are highly dependent on a number of specific factors which are not known at this time (primarily gas composition and flare efficiency).

(11) API 2009. Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industry

Standard industry factors and conservative assumptions (e.g. assuming relatively low flare efficiency) have therefore been used to determine the most appropriate factors to apply in this instance.

The emission factors used for the purposes of calculating GHG emissions from flaring for the planned well testing based on the API Compendium are shown in *Table 4.6*. This table also provides the estimated volume of gas to be flared, per year and resulting estimated emissions of CO_2, CH_4 and N_2O.

Table 4.6 Flaring Greenhouse Gas Calculation (per year)

Fuel type	API Compendium Factors			Maximum volume of gas flared (scf gas)	Calculated total volume of greenhouse gases based on API emission factors (tonnes)		
	Emission factor (converted to tonnes/10^6 scf gas)						
	CO_2	CH_4	N_2O		CO_2	CH_4	N_2O
Gas flared	3.4E-02	2.2E-05	5.9E-07	900,000,000	30.6	0.0198	0.000531

Note: assuming maximum volume of 900 MMscf per year

In terms of overall global warming potential (GWP), the emissions of CH_4 and N_2O can be converted to total CO_2 Equivalent (CO_2E) using standard factors derived from the Intergovernmental Panel on Climate Change (IPCC). Based on these conversion factors, the combined estimated CO_2E emission from the well test flaring per year is provided in *Table 4.7*.

Table 4.7 Combined CO_2E emission Estimate (per year)

Conversion factors to CO_2E (2006 IPCC Guidelines for National Greenhouse Gas Inventories)			Maximum estimated CO_2 equivalent emissions from well test flaring (450 MMscf)
CO_2	CH_4	N_2O	CO_2E
1	x 25	x 298	30.62 tonnes CO_2E

A conservative estimate for the total emission of GHGs from flaring as a result of drill stem tests is therefore around 16 tonnes of CO_2E. This equates to less than 0.1% of the yearly estimated CO_2 Emission due to fuel use by the MODU and is therefore not considered to be material in the context of GHG emissions from the Project as a whole.

4.4.3 Waste Discharges and Disposal

The wastewater generated by the MODU and support vessels includes domestic and sanitary wastewater, deck drainage and bilge water that will be treated and monitored aboard before discharge into the surrounding environment. These wastewater releases will comply with MARPOL 73/78 Annex I requirements (as per vessel class) and the NEQ Guidelines.

A variety of non-hazardous solid wastes will be generated during drilling such as glass, paper, plastic and wood. There will be no planned discharge of solid wastes to the marine environment. All solid wastes will be collected and disposed of at an appropriate facility. Vessels will be operated in compliance with MARPOL regulations (as per vessel class) and the NEQ Guidelines, whereby the discharge of comminuted and disinfected sewage and food waste ground to particle size <25 millimetre (mm) is permitted greater than three nautical miles (nm) from the nearest land.

For sewage not comminuted or disinfected and food waste not ground, discharge is only permitted >12 nm from land. Hazardous wastes such as lubricants, filters, chemical containers, used equipment or batteries will be stored and consolidated for onshore disposal. *Table 4.8* presents estimates of solid and aqueous wastes to be generated by the fleet during the drilling program.

Table 4.8 Typical Waste Quantities over about 60 days Drilling (Tonnes)

Waste Type	Estimated Volume (tonnes) per well	Estimated volume for 2017 (tonnes) for two wells *
Total waste	144	288
Total hazardous (solid and aqueous)	76	153
Total non-hazardous (solid and aqueous)	68	135
Landfill	52	105
Recycling	92	183
Treatment prior to landfill	1	2
Treatment prior to recycling	1	2
Hazardous waste recycling	69	137
Hazardous waste landfill	5	11
Hazardous waste other	5	4
Non-hazardous waste recycling	23	46
Non Hazardous Waste Landfill	46	92

* The total for 2017 is based on drilling up to two wells. If up to four wells are drilled 2018/2019 then the estimated volume would be approximately double.

4.5 PROJECT ALTERNATIVES

Alternatives to the Project were considered in the early stages of Project design. This considered the different options available in order to avoid or reduce any adverse environmental and/or social impacts. A summary of the assessment of Project alternatives is provided in *Table 4.9*.

Well locations are driven by the geological targets selected in advance of drilling, as well as the permit specific commitments to drill wells. The well locations for A-6 are in the process of being finalised and therefore no alternatives for such can be presented in this assessment. Well locations are driven by the geological targets selected in advance of drilling, as well as the permit specific commitments to drill wells. This EIA is based on the assumption that drilling may occur at the Project Area's closest point to the mainland. The Project Area is located about 21 miles (35 km) from the key coastal environmental and social receptors in Ayeyarwady and as such the project activity is unlikely to impact these receptors.

Table 4.9 Summary of Project Alternatives

Option	Alternatives	Selected Alternative	Rationale for selection of alternative
Project	• Proceed with Project • No Project	Proceed with Project	The 'No Project' alternative would potentially result in no further exploration activity in A-6 and, in turn, a delay to any possible oil and gas development in A-6. The exploration for oil and gas stimulates the Myanmar economy. 'No Project' would result in fewer opportunities for gas supply to the domestic market and could lead to less employment opportunities and less economic growth. Given the titleholder obligations regarding A-6, the 'No project' alternative is not considered commercially, contractually or technically practicable.
Drilling Unit	• Dynamically positioned MODU • Jack-up rig • Anchored semi-submersible	Dynamically positioned MODU	A jack-up rig and anchored semi-submersible will require anchoring to the seabed. Given the water depths and metocean conditions in A-6, an anchored drilling unit (such as jack-up rig and anchored semi-submersible) is not technically feasible. Additionally, these options would result in seabed impacts. The dynamically positioned MODU is the most viable option based on a combination of water depth and metocean conditions in A-6, technical drilling and commercial consideration, as well as likely availability.
Drill cutting disposal	• Cuttings re-injection • Ship to shore • Offshore disposal of treated cuttings • Ship treated cuttings to disposal at another deep water location	Offshore disposal of treated cuttings	Reinjection of drill cuttings is not viable for this Project as this would require the drilling of another well and additional infrastructure. Onshore disposal would have less environmental effects on marine environment; however the transport of drill wastes to shore will result in additional transit emissions and the potential effects of onshore waste disposal, as well as additional costs for transport and for possible operational delays. In addition, there are currently no existing operational processing facilities in Myanmar to process the cuttings once they are onshore. The anticipated volume of bottom-hole cuttings for each well is small (97 m^3). Given the dispersive open water characteristics of A-6 (656 ft (200 m) to 6562 ft (2000 m) water depths), the discharge of treated cuttings near the sea surface are expected to disperse over a broad area and impacts to the marine environment are expected to be localised and temporary. Disposal on location also decreases transit emissions and vessel traffic. The selected offshore cuttings disposal option presents the most technically and economically viable option and the option that represents the least adverse overall environmental effects. Given the already deep water characteristics of A-6, shipping the treated cuttings to dispose of at another deep water location would not result in an environmental benefit, and would only result in an increase in vessel traffic and emissions.
Drilling fluid	• Wholly WBDF drilling fluid system • WBDF and NADF	WBDF and NADF	A wholly WBDF drilling fluid system is not technically feasible and a NADF drilling fluid system will be required for the deeper sections of the well. The decision to use NADF for a particular well, or a section of a particular well, is based on a variety of factors relevant to well bore conditions such as well temperature, well profile (depth, inclination, and azimuth) well bore stability and well bore friction. Significant improvements in the composition of NADF deliver increased drilling performance with a significant reduction in the toxicity and environmental impacts of such fluids. New generation Group III drilling fluids, such as paraffins, olefins and esters are less toxic and are more biodegradable than

Option	Alternatives	Selected Alternative	Rationale for selection of alternative
			early generation diesel and mineral oil base fluids. NADF drilling fluid will only be operationally discharged as oil-on-cuttings following return to the MODU for separation of muds and cuttings using SCE to reduce the residual level of NADF on the drill cuttings prior to discharge below the sea surface. The decision to use NADF is subject to environmental, technical, health and waste management considerations. All chemicals that may be discharged to the marine environment during the drilling activity are required to be selected and approved as per the Woodside Chemical Assessment Process which is consistent with the UK Offshore Chemical Notification Scheme (OCNS). All Woodside approved chemicals are included on the Chemical Selection List which is regularly reviewed.

5 DESCRIPTION OF THE SURROUNDING ENVIRONMENT

5.1 INTRODUCTION & SETTING THE STUDY LIMITS

The following section describes the physical, biological and social environment (mainly fishing) within the waters of offshore Myanmar and the potential Area of Influence. For the biological environment, the Area of Influence covers the offshore waters of A-6, as well as its immediate surroundings. For social environment, the Area of Influence includes Ayeyarwady Region, and the key decision making centres (Yangon and Naypyidaw) and any towns where fishermen could potentially fish in the waters of offshore Ayeyarwady Region.

The Study Area covers the Area of Influence and also extends to the Rakhine Coastal Region and encompasses the coastline of Ayeyarwady Region and southern Rakhine State, although these are located about 21 miles (35 km) from the Project Area and considered to be outside of the Area of Influence due to the distance from Project activities.

5.2 METHODOLOGY

The information provided in this section is based on a desktop review of published information, supplemented with information provided by Woodside and through review of available ERM and E Guard in house literature. These data has also been supplemented by data provided from various different stakeholders, including government bodies (e.g. Ministry of Education's Department of Marine Science), scientific organisations (e.g. Marine Science Association Myanmar), NGOs (Wildlife Conservation Society), and local communities.

Where possible, environmental and social information collected as part of the A-6 three dimensional (3D) seismic survey and exploration drilling program in early 2016 has also been incorporated. Primary social data collected during consultations in Ayeyarwady in June 2016 have also been used to supplement the known information. The objective of this section is to ensure there is a robust environmental and social baseline for the Study Area against which the potential Project impacts can be assessed.

5.3 PHYSICAL CHARACTERISTICS

5.3.1 Climate and Meteorology

The weather and climate of Myanmar is primarily influenced by the Northeast and the Southwest Monsoons and the short transitional periods between them. A high level study of the meteorological and oceanographic conditions in Myanmar has been performed. This study found that for the majority of time prevailing winds are from the north from October to February, and the west and south west for the remainder of the year. This coincides with general climate information on Myanmar which shows a pattern of the southwest monsoon (June to September) is characterised by extensive cloud cover, light rain almost daily, interspersed with rain squalls or thunderstorms. The northeast monsoon (December to April) brings less cloud, scant rainfall, mild temperatures and lower humidity during winter.

The spring and autumn transition periods between the monsoons (April and May, October and November) are generally hot with very variable weather and heavy squalls. The transition periods are governed by the Inter-Tropical Convergence Zone (ITCZ) which separates the main wind streams of the northern and southern hemispheres. The ITCZ moves seasonally over the area (northwards in spring and southwards in autumn), with no well-defined weather pattern.

5.3.2 Oceanography and Hydrography

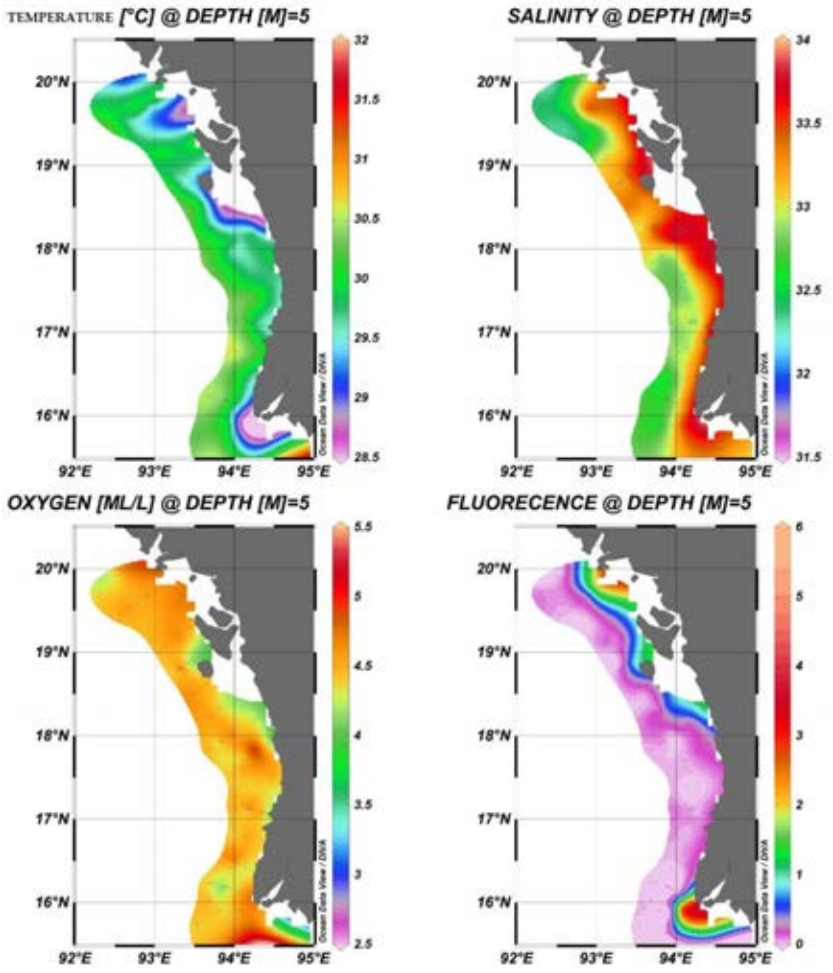
The surface circulation of the Bay of Bengal moves generally clockwise from January to July and counter-clockwise from August to December, in accordance with the reversible monsoon wind systems. The flow is not constant and depends on the strength and duration of the winds. The effects of a strong wind blowing for a few consecutive days are reflected in the rate of flow. Currents to the northeast generally persist longer and flow at greater speed because of the stronger southwest monsoons. An important vertical circulation in the Bay of Bengal is a surge very similar to up-welling. In this process, sub-surface water is brought toward the surface.

Tides in the Study Area are semi-diurnal with a tidal range of about 7.5 ft (2.3 m) to 13.8 ft (4.2 m) at spring tides. Where the tidal currents meet the more static bodies of oceanic water, or where the current runs against the prevailing winds, there are agitated areas of the sea known as overfalls.

An oceanographic survey of the waters of the Rakhine Coastal Region (in which A-6 is located) was conducted in April 2015 as part of the 'Dr. Fridtjof Nansen' survey [12]. The near surface (16.4 ft (5 m) depth) water temperature ranged from 29°C to 30.5°C. The survey indicated water column stratification in offshore waters associated with the shelf edge at the time of sampling. Water plumes near the coast of the border to Bangladesh, around Manaung Island, the waters off Thandwe showed the lowest temperatures (*Figure 5.1*). Salinity measurements at 16.4 ft (5 m) depth ranged between 32 and 34 parts per thousand (ppt), with the lowest values found further offshore. Oxygen levels in surface waters were generally high (~ 4–5 mg/L), and showed relatively high variability. The lowest oxygen concentrations were associated with the coldest water. Information collected on temperature, salinity, fluorescence and oxygen levels is presented visually in *Figure 5.1*.

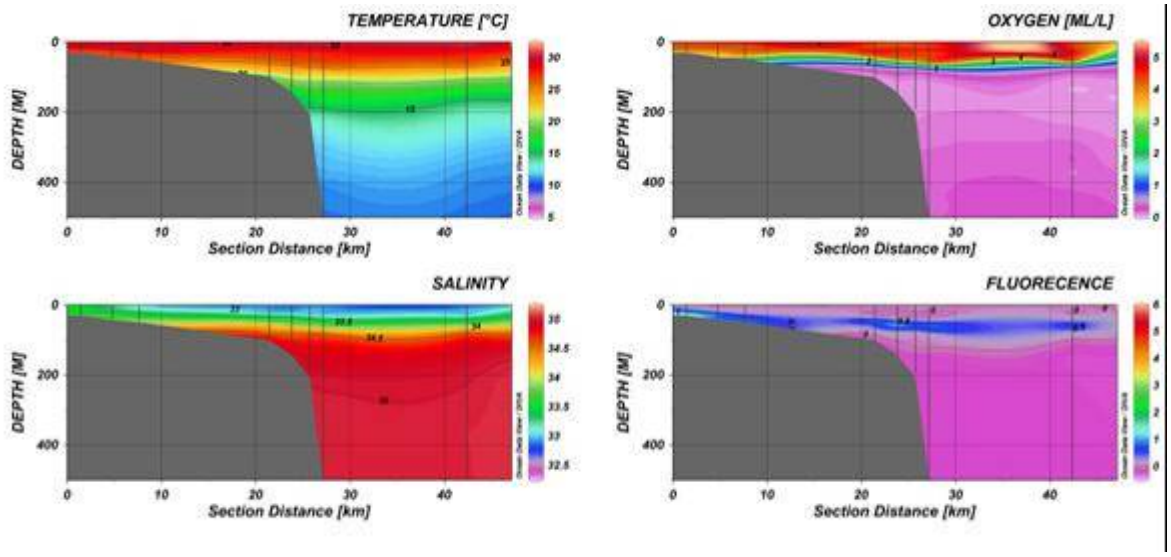
Surveys to record temperature, oxygen levels, salinity and fluorescence (indicative of phytoplankton/chlorophyll a levels) were also taken along transects extending from nearshore to offshore and profiled to show measurements with depth. The closest transect to A-6 is located offshore Pathein (*Figure 5.2*). The strongest temperature, oxygen and salinity clines (i.e. changes) were associated with the shelf edge. The coldest water was typically <10°C in the 400–500 m depths, increasing to 15°C around 200 m. The depth of the strongest salinity- and oxygen -clines seem strongly correlated at around 70–100 m depth. Below this depth range, the water masses were typically of highest salinity and with hypoxic O2 levels <0.25 parts per million (ppm) to more than 500 m depth.

(12) Myanmar Ecosystem Survey (2015). FAO-NORAD Project No: GCP/INT/003/NOR. Cruise Report "Dr. Fridtjof Nansen". EAF – N/2015/



Source: Myanmar Ecosystem Survey (2015). FAO-NORAD Project No: GCP/INT/003/NOR. CRUISE REPORT "Dr. Fridtjof Nansen". EAF – N/2015/

Figure 5.1 Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Rakhine coastal region



Source: Myanmar Ecosystem Survey (2015). FAO-NORAD Project No: GCP/INT/003/NOR. Cruise Report "Dr. Fridtjof Nansen". EAF – N/2015/

Figure 5.2 Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in Transect No. 1, Offshore Sittwe

5.3.3 Seabed Bathymetry and Composition

The seabed topography along the coast of Myanmar falls under two distinct types with the narrow continental shelf and deep water in the north, which is typical of the Bay of Bengal, and the wide continental shelf and shallow waters in the south, which is typical of the Andaman Sea and the Gulf of Martaban. The continental slope is not a uniform slope, instead being incised by steep gullies and canyons.

A-6 straddles the boundary between the continental shelf and deep water in the offshore environment of west Myanmar. The block encompasses water depths ranging from about 32 ft (10 m) up to about 7870 ft (2400 m). *Figure 1.1* presents the bathymetry of the Study Area. The deepwater physical habitat of A-6 is likely to be composed of soft sediments considered to be typical of deep water oceanic environments and likely dominated by silts and muds. ROV footage, recorded in November 2015 of the Shwe Yee Htun-1 well (Block A-6) well site and surrounds (at a depth of about 6620 ft (2019 m)) were reviewed by Woodside and confirmed the seabed habitat of Shwe Yee Htun-1 was composed of unconsolidated soft sediments (refer to *Section 5.4.1* and *Plate 5.1* for photos taken from ROV) [13].

5.3.4 Natural Hazards

Earthquakes

A review of available literature has shown that Myanmar is seismologically unstable and vulnerable to earthquakes due to its location in the active Alpide seismotectonic belt and the young Alpine-Himalayan-Sumatran orogenic belt [14]. Historic records show that at least 15 major earthquakes with magnitudes M≥7.0 Richter Scale have occurred in Myanmar in the last hundred years. These earthquakes occurred within the Ayeyarwady Delta in the last century, at Bago (5 May 1930), at Yangon (27 March, 16 May and 21 May 1931), at Sagaing (16 July 1956) and at Bagan (8 July 1976) [15]. Historical records of earthquakes are noted within and nearby the Study Area and the magnitudes of the earthquakes were ranked six or less [16] (*Figure 5.3*).

Tsunami

Myanmar is an earthquake-prone country and at moderate risk for tsunamis. Tsunamis have been recorded in the Myanmar coastal areas. The recent 2004 tsunami generated by the Sumatra earthquake caused moderate damage to the Rakhine Coast, Ayeyarwady Delta and the Tanintharyi Coast with more than 60 lives and hundreds of boats lost [17]. The western Rakhine Coastal Region which encompasses Pathein and Thabaung Township, is generally rocky and sandy without mangrove protection. As such, it is considered that this area is vulnerable to a potential tsunami.

Deepwater Methane Seeps and Marine Mud Volcanoes

As part of a seabed coring study, Woodside obtained visual imagery (high resolution video and stills) of the seabed habitat and associated biota of a deepwater methane seep and a marine mud volcano, located about 50 km and 49 km, respectively, offshore in Block A-7 (A-7).

Mud volcanoes are composed of mud, water and gas which has been extruded from the sub-surface. They occur globally both on land and underwater and are commonly associated with subduction zones. These features are formed as gas and water in the sub-surface are forced upwards due to pressure effects mixing with mud and causing it to become buoyant. The mixture

(13) ROV footage (as left and as found surveys) completed as part of the standard operational well activities

(14) Theilen and Pararas-Carayannis (2009) *Op cit.*

(15) Union of Myanmar (2009), Op cit.

(16) Union of Myanmar (2009), Op cit.

(17) Union of Myanmar (2009), Op cit.

may eventually come to the surface where it is deposited through vents or fractures, in this case on the seafloor.

Numerous underwater mud volcanoes were identified in A-7 as part of the seafloor sampling program and are likely to present in a similar trend in A-6. Mud volcanoes are also present on Ramree and Cheduba (Manaung) Islands.

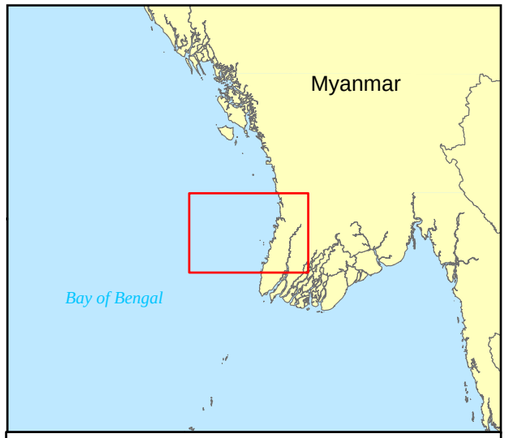
Underwater seeps were also observed during the seafloor coring study. These seeps occur when gas escapes through fissures or cracks on the seafloor caused by tectonic activity. Seeps are known to occur all over the world and are often associated with continental margins. The chemical reaction between the methane gas and the seawater can initiate the precipitation of carbonate material on the seafloor.

Preliminary findings from a review of the imagery have confirmed the following:

- The mud volcano seabed habitat is composed of soft sediment and rubble (shell fragments). There appears to be a suite of biota associated with this habitat. Observations included aggregations of large gastropods (snails), spiny crabs (crustacea) and a variety of fishes including a small shark species.
- The deepwater seep habitat is composed a soft sediment seabed and additional seabed substrate formed from the precipitation of authigenic carbonate. There appears to be a suite of biota associated with this deepwater habitat with monospecific beds of bivalves (mussels) and obligate gastropods, polychaete worms, microbial mats and fish life (type of flounder) observed.

Cyclones

Gale force winds (17.2 metres per second (ms^{-1}) or over) are mainly associated with local rain squalls and with severe tropical storms or cyclones. The central region of the Bay of Bengal receives the worst buffeting during the summer monsoon. Myanmar is a cyclone prone country and Cyclone Nagris of 2008 was the worst natural disaster in the country's recorded history. Coastal habitat destruction, in particular, the clearance of mangrove habitat is likely to have exacerbated the destructive impacts of the cyclone. The threat of cyclones with winds above 107 ft (32.7 ms^{-1}) affects different areas at different times of the year, affecting all areas though the major tracks do not pass over the Andaman Sea. They are most frequent from mid-May to early December.



Legend

Block A-6

Town

Earthquake Magnitude Rank

- 7 - 7.9
- 6 - 6.9
- 5 - 5.9
- 4 - 4.9
- < 4

Depth (m)

- > -10
- -10.1 - -20
- -20.1 - -30
- -30.1 - -40
- -40.1 - -50
- -50.1 - -60
- -60.1 - -70
- -70.1 - -80
- -80.1 - -90
- -90.1 - -100
- -100.1 - -500
- -500.1 - -1000
- -1000.1 - -1500
- -1500.1 - -2500
- < -2500

Kilometres

0 25 50

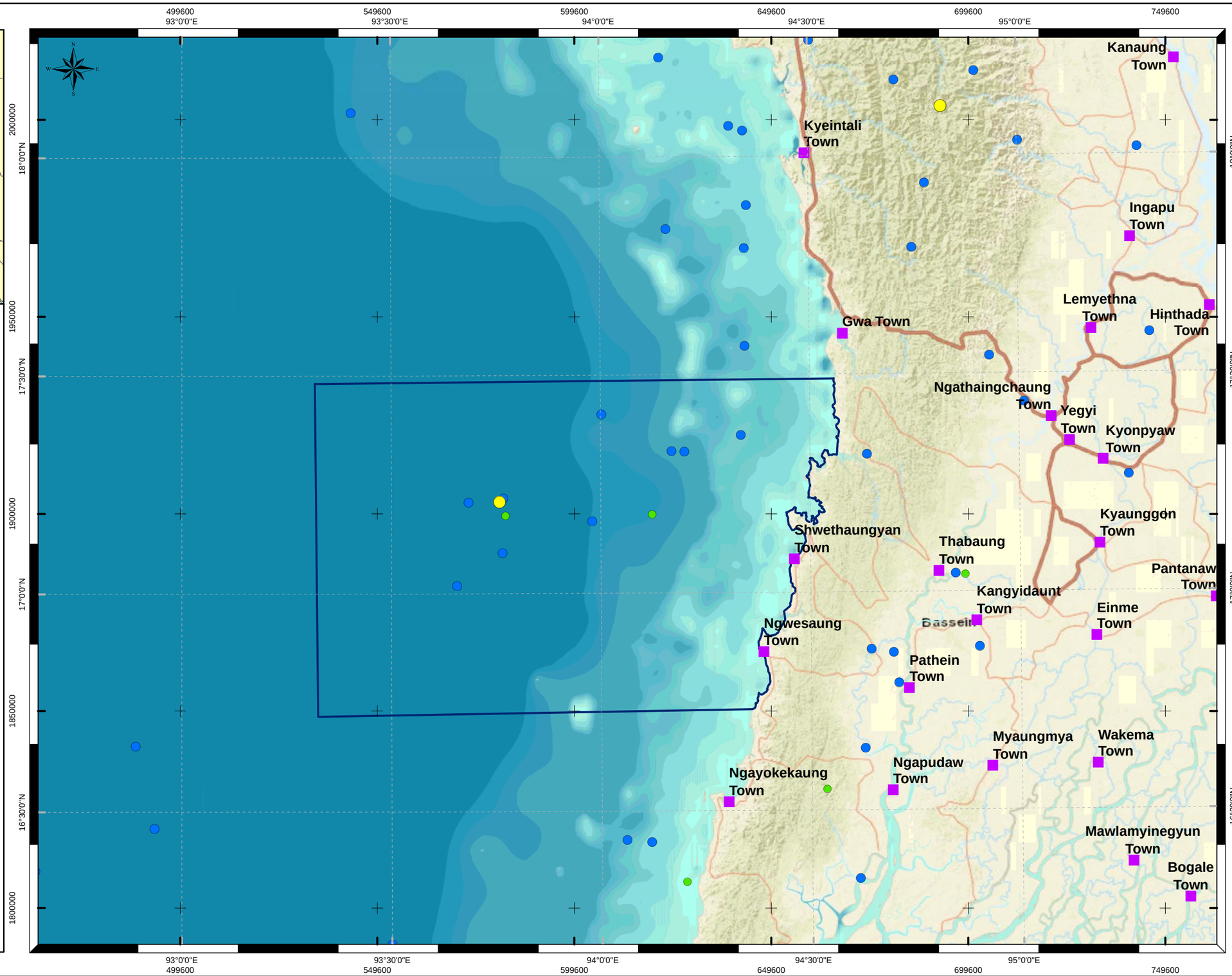


Figure 5.3

Historic Earthquake Locations in Study Area

File: T:\GIS\CONTRACT\0360592\Mxd\0360592_Earthquake.mxd
Date: 9/9/2016

Environmental Resources Management

ERM

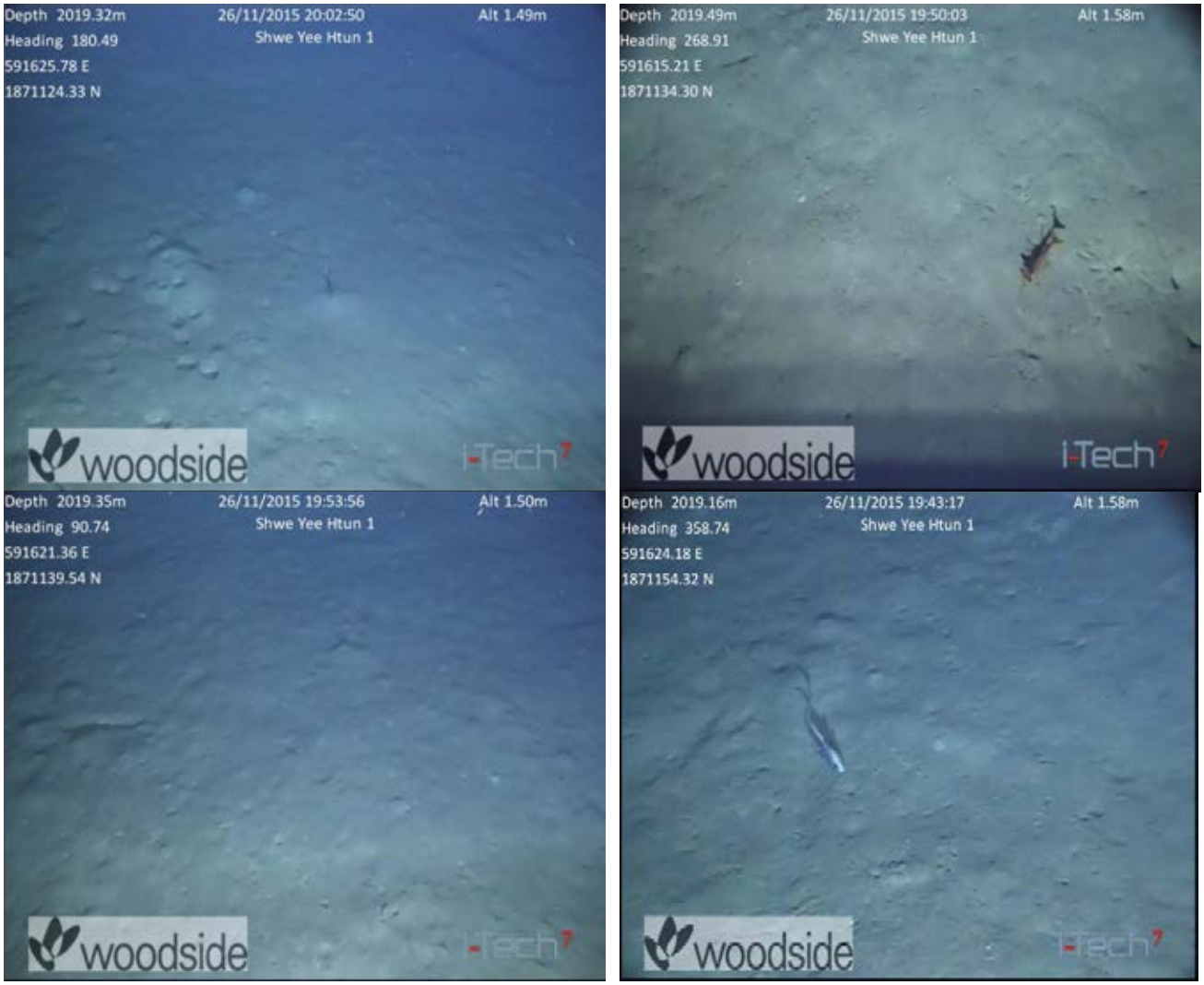
5.4 BIOLOGICAL CHARACTERISTICS

5.4.1 Offshore Deepwater Habitats within the Area of Influence

The Project Area encompasses deepwater habitats (water depth of 656 ft (200 m) to 6561 ft (2000 m)) traversing the continental shelf and slope as well as the deeper seabed habitat off the continental slope. Woodside Energy Limited is an experienced operator with extensive experience operating in a deepwater environment. This experience has shown that deepwater seabed environments will typically be comprised of homoegenous and widespread soft sediment habitat, with benthic biota including a typical suite of macrofauna on and within the seabed sediments. Although there is limited information available on the composition of benthic biota associated with the deep water habitats (e.g. continental slope and abyssal plain) within the Study Area and the wider Bay of Bengal, macrofauna such as polychaetes, molluscs and crustaceans as well as echinoderms and soft corals are expected to inhabit the soft bottom habitat within A-6.

Species representative of the deepwater habitats of the wider region such as polychaetes, foraminifera, hydrozoa, sponges, crustaceans, molluscs and echinoderms are likely present given the environmental setting (offshore, deepwater) and the soft sediment seabed habitats (widespread and homogeneous). These expectations were supported when Woodside environmental specialists reviewed ROV footage of the Shwe Yee Htun-1 well site and surrounds (at a depth of about 6620 ft. (2019 m)). The high resolution footage showed soft sediment seabed with no hard substrate, and evidence of marine life as indicated by the bioturbation and animal tracks and mounds (visible markings and shapes on the surface of the sediment). These markings indicate presence of infauna and mobile epifauna such as shrimp (Crustacea). Epifauna (animals visible on the seabed surface) were generally absent and fish life was sparse (individual deepwater fish (unidentified species) observed). Some representative photos from this ROV footage are shown in *Plate 5.1*. These findings indicate that the A-6 deepwater environment is largely comprised of a soft sediment seabed habitat with benthic fauna typical of the region and of a low biodiversity value.

Plate 5.1 Representative ROV Photos from Shwe- Yee -Htun-1 Location



Images extracted from ROV footage recorded as part of the 'As found' survey for Shwe Yee Htun-1 well (Block A-6)

5.4.2 Coastal Habitats within the Study Area

The following sections provide a brief overview of the coastal habitats within the Study Area, which are located about 21 miles (35 km) from the Project Area, therefore outside of the Project's Area of Influence (i.e. immediate surroundings of A-6). The coastal habitats are those within the Ayeyarwady Region and southern Rakhine State and refer to seagrass, coral reefs, mangroves and their associated species. These are thought to be also present around the vicinity of Ngwe Saung beach which is located over 21 miles (35 km) from the Project Area. Given the distance between habitats and Project activities, it is unlikely that there will be any impact on these coastal receptors. The locations of coastal habitats taken from secondary baseline data sources, and through engagement with various stakeholders, are shown in *Figure 5.4*.

Coral Habitats

UNEP satellite analyses indicate the presence of coral communities (typically fringing or patch reefs) along the coast of the Ayeyarwady Region, including within the shallower waters of A-6 (*Figure 5.4*). The prevalence of rocky substrate in shallow waters indicates likely favourable conditions for the growth of corals and coral communities. The closest coral habitat to the Project Area is at least 18 miles (30 km) to the east in the nearshore environment of the western Ayeyarwady Region.

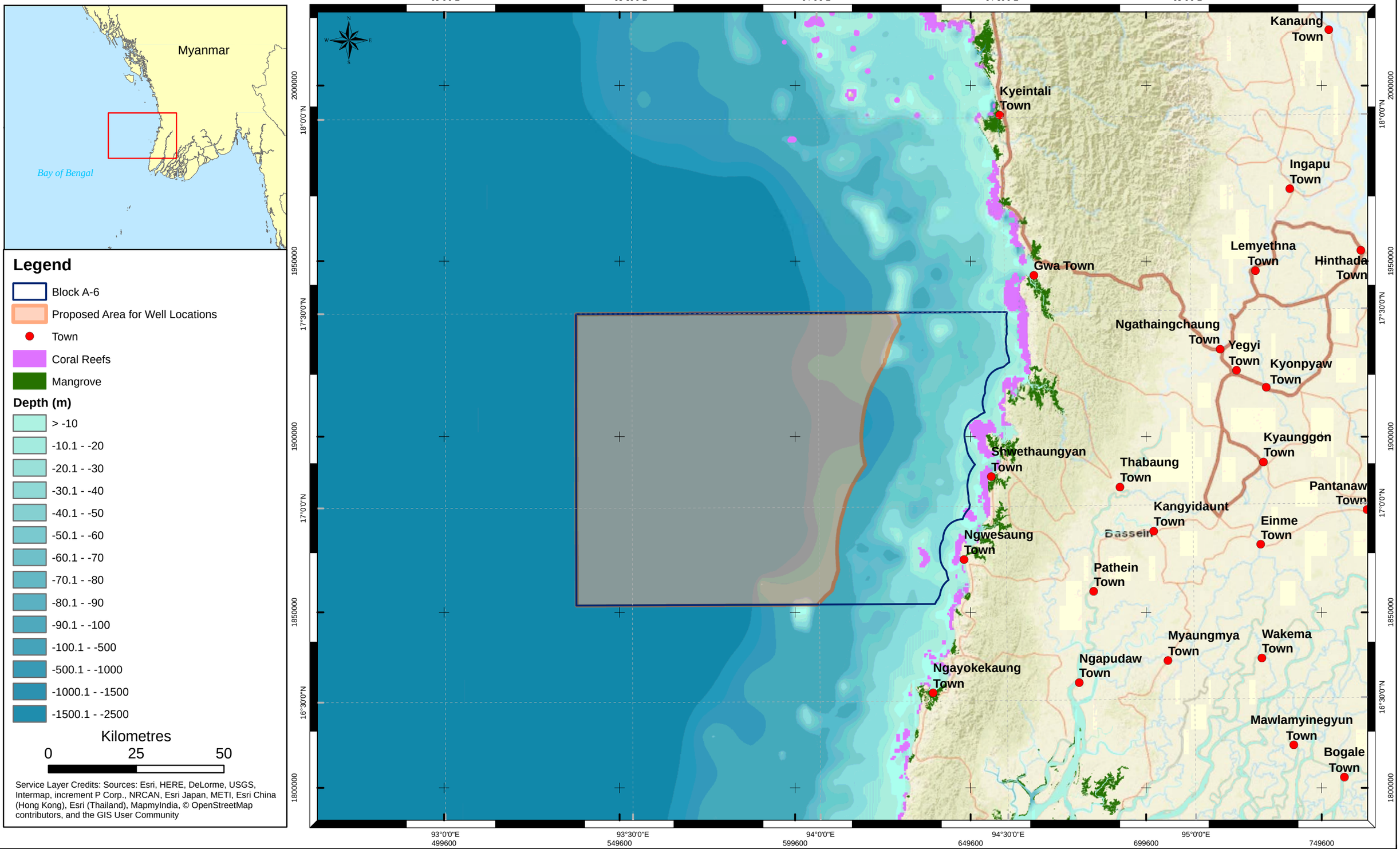


Figure 5.4

Coastal Habitats in the Study Area

File: T:\GIS\CONTRACT\0360592\Mxd\0360592_Coastal_Habitats.mxd
Date: 1/8/2016

Environmental Resources Management

ERM

Mangroves

Along coastline of the Ayeyarwady Region, there are mangrove habitat areas occurring along shoreline margins of river mouths and extending inland fringing tidal creeks. There are also mangrove stands reported for sheltered areas along the coast. Mangroves recorded from Ayeyarwady Region include *Rhizophora*, *Xylocarpus*, *Avicennia*, *Bruguiera*, *Sonneratia*, and *Ceriops* species. The known distribution of mangrove habitat within the Study Area is illustrated in *Figure 5.4*.

Reduction in mangrove areas is known in the Study Area along the Ayeyarwady Region coast. The main pressures are firewood collection by local communities and reclamation of mangrove habitat for agriculture and aquaculture. Known coastal mangrove habitats are located about 21 miles (35 km) from the boundary of A-6 [18].

Seagrass

Seagrass beds occur along the nearshore habitats of the Ayeyarwady Region and typically occur in less than 65 ft (20 m) water depth in sheltered intertidal or subtidal areas [19]. The locations of seagrass habitat along the western coast of Ayeyarwady Region are shown in *Figure 5.4*.

In waters around Ayeyarwady Region, seagrass beds are expected to serve as nurseries and habitats for fish and invertebrates, and may also provide a food source for species of international and national conservation interest including marine turtles and dugongs (*Dugong dugon*). Dugongs feed almost exclusively on seagrass [20]. Given that seagrass habitat is confined to shallow waters with good light penetration; the nearest potential habitats are located about 21 miles (35 km) away from the closest boundary of the Project Area.

5.4.3 Submerged Shoals

Subsea topographic features on the outer edge of the continental shelf of the Rakhine Basin were explored as part of a Woodside-commissioned seabed coring survey conducted in A-7 in April/May 2016. Woodside obtained visual imagery (HR video and stills) of the seabed habitat for portions of two submerged shoals within A-7, approximately 40-50 km from the coast. The shoals are marked on the nautical chart for the Rakhine Basin and are located on the continental shelf edge. The submerged shoals, Juanita Shoal, intersecting the southern boundary of A-7, and an unnamed shoal intersecting the northern boundary of A-7 and extending into A-6, are geomorphological features several kilometres in length and width extending from depths of 30-40 m to >100 m below the sea surface.

Preliminary examination of a subset of images by marine scientists from the Australian Institute of Marine Science has confirmed the following characteristics:

- Evidence of light-dependent benthic communities, more frequently present on the shallower areas surveyed, composed of macro-algae (*Halimeda* spp., unidentified brown and red fleshy algae species), low hard coral and other sessile invertebrate cover, encrusting red algae and aggregates of free living coralline algae (possibly rhodoliths).
- Evidence that the light-dependent components of these benthic communities dissipate over the depth range 40-100 m.
- Evidence to suggest that the offshore waters of the Rakhine Basin support areas of higher benthic productivity and diversity, in comparison to surrounding areas, on submerged shoal features along the shelf edge.

(18) Ocean Data Viewer. UNEP-WCMC. Available from **http://data.unep-wcmc.org/**

(19) Short FT, Coles RG and Pergent-Martini C 2001. Global Seagrass Distribution in Short, FT, Coles RG and Elsevier Science BV (eds) Global Seagrass Research Methods. pp 5-30.

(20) Lanyon, JM, Limpus, CJ & Marsh, H 1989, 'Dugongs and Turtles: Grazers in the Seagrass System', in Biology of Seagrasses. A Treatise on the Biology of Seagrasses With Special Reference to the Australian Region, eds AWD Larkum, AJ McComb & SA Shepherd, Aquatic plant studies, vol. 2, pp. 610–634

Survey coverage of the unnamed shoal, where it extends into A-6, was not undertaken in April/May 2016. It is, however, inferred from the known topography of this shoal that similar benthic communities as observed for the shallower portions of Juanita Shoal are likely to be present on the shallower areas.

5.4.4 Plankton

Moderate Resolution Imaging Spectrometer (MODIS) Aqua satellite datasets [21] from the area within and surrounding A-6 show that chlorophyll a concentrations and inferred phytoplankton standing crop levels in the surface layer are higher in the Northeast season (November to March) than in Southwest (June to September). As is typical, highest chlorophyll levels ranging up to ten milligrams per cubic metre (mg/m^3) occur closest to the coast likely due to nutrient inputs from river outputs.

There are limited data on the species composition, abundance and distribution of plankton within the Study Area. Some studies have been undertaken in the wider Bay of Bengal with for instance; phytoplankton communities found to be dominated by diatoms (Bacillariophyceae) followed by dinoflagellates (Dinoflagellata) in terms of abundance in different survey areas (north, west and east). The composition, abundance and distribution of phytoplankton species was recorded in November 2007 [22] during the northeast monsoon period which spans December to April. During this survey, the northern part of the Bay of Bengal (located offshore of the waters of Myanmar between Myanmar and India) was found to be the most productive area with high phytoplankton densities recorded, likely associated with nutrient-rich discharges from large rivers on the north coast.

Plankton populations are naturally extremely patchy and variable over time. Most species of plankton have short generation times, high fecundity and high abundance over a large area, particularly, in the open water, offshore environment. For these reasons plankton populations within the Project Area are not considered to be potentially impacted by the project activities.

The above description is for phytoplankton only as there is no available data for other forms of plankton such as zooplankton or meroplankton. These forms would be present and are likely to follow similar seasonable patterns in abundance.

5.4.5 Fish Assemblages

Fish assemblages are expected to vary across the Area of Influence given the range of water depths. A-6 is located in offshore, open water where fish species are expected to include commercially important pelagic species belonging to the families Clupeidae (herring and anchovies) and Scombridae (mackerel and tuna) as well as demersal species such as snapper, thread fin/Indian salmon and croaker. Pelagic species are those that inhabit open water areas (such as the Project Area) and generally undertake large migrations between feeding grounds and spawning areas throughout the year.

Recent trawl surveys to look at fisheries composition were conducted by the R.V. Dr. Fridtjof Nansen in 2013 and covered 41 fishing stations in Rakhine State and west coast of the Ayeyarwady Region, as well as other parts of Myanmar waters. The closest transect to A-6 is the Dome Hill transect located offshore Pathein Township. The findings were summarised as showing that pelagic marine fishery resources have significantly decreased, tenfold for this sample example, between 1980 and 2013, which was attributed to exploitation by fisheries.

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(21) NOAA 2015. Giovanni Ocean Color Radiometry - Water Quality Portal. Viewed at: **http://giovanni.sci.gsfc.nasa.gov/giovanni/#service=TmAvMp&starttime=1996-10-01T00:00:00Z&endtime=1997-02-28T23:59:59Z&shape=state_dept_countries/shp_146&bbox=92.17180802700034,9.592888832000003,101.16623000000061,28.547707000000827&data=OCTS_L3m_CHL_2014_chlor_a&variableFacets=dataFieldMeasurement%3APhytoplankton%3B**

(22) Booonyapiwat, S., Nasiruddin Sada, Md, Mandal, J.M., and Sinha, M.K. Species Composition, Abundance and Distribution of Phytoplankton in the Bay of Bengal. The Ecosystem-Based Fishery Management in the Bay of Bengal.

An “Ecosystem Survey” as an extension to this Project was carried out between April and June 2015 by the Institute of Marine Research, Norway and Myanmar’s DoF [23].This survey used two methods to assess the number of fish species in Myanmar waters; an acoustic survey and a catch survey. Information from this report is summarised below. Acoustic abundance and distribution was estimated for two species groups during the survey; 1. Clupeidae and Engraulididae and 2. Carangidae, Scombridae, Barracuda and Hairtails. The Group 1 species were separated from the Group 2 species based on their presence in catches, and the fact that Clupeidae and Engraulididae has a much stronger backscattering signal then Carangidae and other Group 2 species. The most common Group 1 species on the Rakhine coast was the Engraulidae *Stolephorus indicus*, while no other clupeids were frequent in the catches. This species was mostly present in low density concentrations close to the coast, mainly shallower than 164 ft (50 m). A total acoustic abundance index of 21,000 tonnes of fish was estimated based on a set (average) total length of 10 cm, which was about double the 2013 estimate of 10,000 tonnes. However, this is considered to be well within the range these species can fluctuate in abundance (*Figure 5.5*).

The most common Group 2 species found in the region was the Hairtails; *Trichiurus lepturus* and *Lepturacanthus savala* and the Carangids; *Selar crumenophthalmus* and *Decapterus russelli*. The species composition of pelagic species during this survey was considerably different from the November–December 2013 survey. During that survey *Lepturacanthus savala*, the Carangids *Megalaspis cordyla, Carangoides malabaricus* and the Scombrids *Scomberomorus guttatus* and *Rastrelliger kanagurta* dominated. The total acoustic abundance index was 19,000 tonnes compared to 23,000 tonnes in 2013.

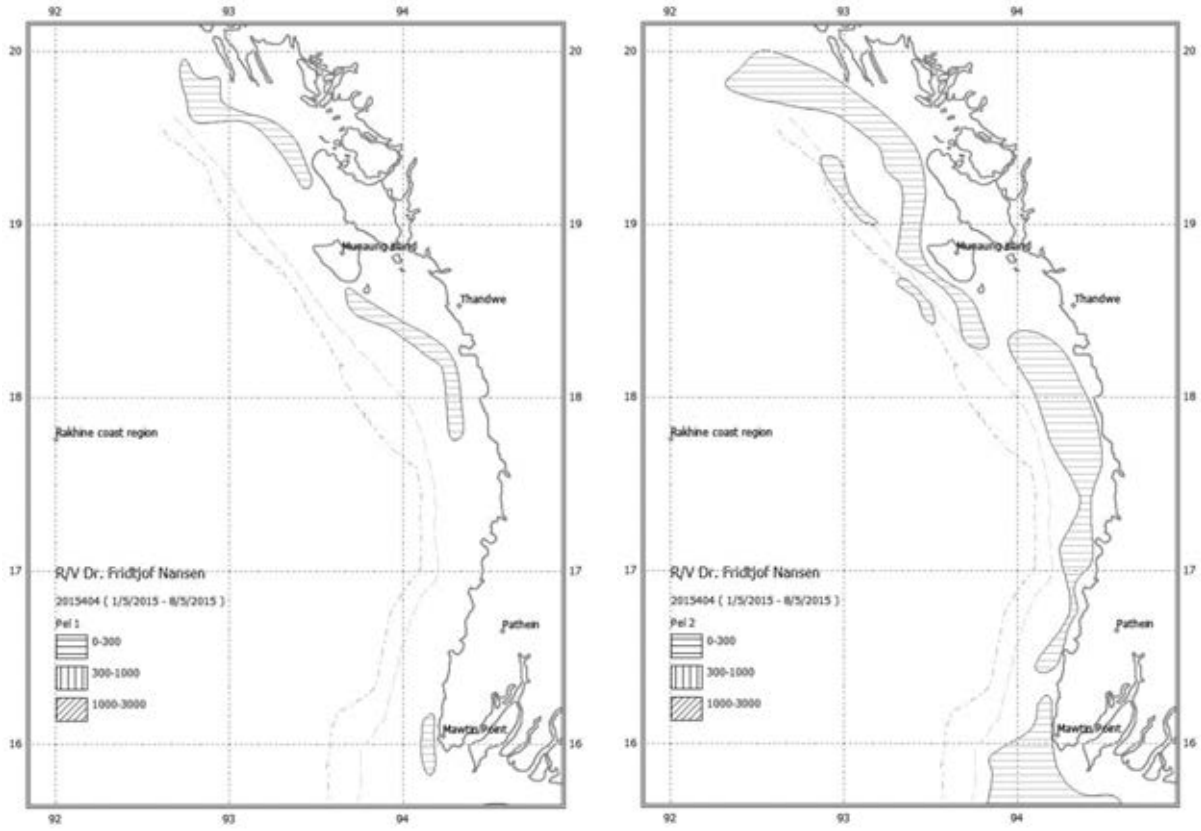
Trawl surveys [24] investigating fisheries composition were conducted in 2015 in Ayeyarwady Region [25], as well as other parts of Myanmar waters. The most common species caught were the Indian anchovy (Engraulidae *Stolephorus*), yellow stripe scad, *Selaroides leptolepis*, followed by hailtails, such as, *Trichiurus lepturus* and scad, such as, *Selar crumenophthalmus*. Trawls were conducted in the Rakhine Coastal Region; offshore Ayeyarwady Region at 49 different stations: 16 between 20–50 m depth, 14 between 50–100 m depth, 13 between 100–200 m depth, five between 200–500 m depth and one at > 500 m. These reported a mixed group of species representing pelagic and demersal finfish and invertebrates at the lowest depth surveyed (i.e. 200–500 m depth) i.e. on the lower slope where the wells are proposed to be drilled. The species present included gurnards, cusk eels, crustaceans (shrimps, crabs and lobsters) and, cuttlefish and octopus.

(23) Myanmar Ecosystem Survey (2015). FAO-NORAD Project No: GCP/INT/003/NOR. Cruise Report "Dr. Fridtjof Nansen". EAF – N/2015/

(24) Myanmar Ecosystem Survey (2015). FAO-NORAD Project No: GCP/INT/003/NOR. Cruise Report "Dr. Fridtjof Nansen". EAF – N/2015/

(25) Trawls conducted by the R.V. Dr. Fridtjof Nansen in 2013 and covered 41 fishing stations at water depths of between 200 and 1000m

Figure 5.5 Distributions of acoustic backscattering of Group 1 (a) and Group 2 (b) species along the Rakhine Coastal Region



(a) (b)

Source: Myanmar Ecosystem Survey (2015). FAO-NORAD Project No: GCP/INT/003/NOR. Cruise Report "Dr. Fridtjof Nansen". EAF – N/2015/

A total of 372 different species were caught in the Rakhine Coastal Region stations, with 48 of these recorded over 200 m water depth. The greatest number of species was recorded in 20–50 m water depth (200 species). Biomass estimates of this depth in Rakhine coast are 23,000 in 2015, up from 2013 estimates of 5200. The results of the analysis by region showed that the most common species (groups) in the Rakhine Coastal Zone were hairtails (*Trichiurus lepturus),* bigeye (*Priacanthus hamrur*)*,* jellyfish*,* lizard fish (*Saurida tumbil*)*,* toothpony fish (*Gazza minuta*)*,* Japanese threadfin bream (*Nemipterus japonicas),* spinycheek lanternfish (*Benthosema fibulatum*)*, Decapterus sp.,* and Indian anchovy (*Stolephorus indicus*).

The main commercial fish species in Myanmar waters are shown in ***Annex 5.1***. This list was compiled from information from the Myanmar National Report [26] and the 2015 survey discussed above.

Of the pelagic species most commonly caught in Myanmar waters [27], one is considered as a species of conservation concern on the IUCN 2015 Red List; narrow barred Spanish mackerel (*Scomberomorus commerson*). Mackerel are caught in open water areas and could potentially be found within the Project Area. Swordfish (*Xiphias gladius*), striped marlin (*Tetrapturus audax*) and sailfish (*Istiophorus platypterus*) also inhabit Myanmar offshore waters, with swordfish being the

(26) Myint Pe undated. National Report of Myanmar on the Sustainable Management of the Bay of Bengal Large Marine Ecosystem (BOBLME) GCP/RAS/179/WBG

(27) Myint Pe undated. National Report of Myanmar on the Sustainable Management of the Bay of Bengal Large Marine Ecosystem (BOBLME) GCP/RAS/179/WBG.

most abundant species and the potential to be a future commercial fish. These and other species, such as pelagic thresher (*Alopias pelagicus*), oceanic white-tipped shark (*Carcharhinus longimanus*), escolar (*Lepidocybium flavobrunneum*), pelagic stingray (*Dasyatis sp.*), and snake mackerel (*Gempylus serpens*) were also found in a survey reported by Julius Kyaw of Myanmar's DoF (2011) [28].

Whale sharks (*Rhincodon typus*) are listed as vulnerable on the IUCN 2015 Red List. This species is highly migratory occurring in both tropical and temperate waters, though there is a general lack of knowledge on many aspects of whale shark biology, including definitive migration patterns. The species normally has an oceanic distribution but can occur in coastal waters. In the Bay of Bengal, whale sharks have been recorded in the northern area of Bengal (off the Bangladesh coast) from December to March.

Data on other sharks found within the Bay of Bengal are limited, scalloped hammerhead *(Sphyrna lewini*) and great hammerhead (*Sphyrna mokarran*); both listed as Endangered on the IUCN 2015 Red List are found within Myanmar's domestic waters, records predominantly derived from by-catch data. Other sharks reported in the Bay of Bengal include the vulnerable smooth hammerhead (*Sphyrna zygaena*); and various other shark species.

5.4.6 Marine Mammals

A total of 21 cetaceans (whale and dolphin) and one sirenian (dugong) species have been reported in Myanmar waters [29]. Two species, the Irrawaddy dolphin (*Orcaella brevirostris*) and dugong (*Dugong dugon*), have been protected under the Myanmar Protection of Wildlife and Conservation of Natural Areas Law since 1994 under the category "completely protected". The known species are shown in *Figure 5.6*.

Cetaceans

Of the whale and dolphin species potentially present in Myanmar waters, most are far-ranging, migratory species though there are several coastal species with closer affinities to shallow water habitat areas and estuarine areas.

Given the location of A-6 (about 21 miles (35 km) from the coast), open water species of marine mammal are of primary interest. The IUCN-listed threatened cetacean species in Myanmar waters include three species of large whale, namely the blue whale (*Balaenoptera musculus*) (Endangered), fin whale (*Balaenoptera physalus*) (Endangered) and sperm whale (*Physeter macrocephalus*) (Vulnerable). The blue whale and the fin whale are also listed as endangered species recognised as of prime importance to the Region and deserving special attention under the ASEAN Agreement on the Conservation of Nature and Natural Resources [30]. Other common deeper water species such as humpback whale (*Megaptera novaeangliae*) and Bryde's whale (*Balaenoptera edeni*) are known to occur in offshore waters in Myanmar however, these are listed as Least Concern and Data Deficient on the IUCN Red List, respectively.

Coastal species known to occur in Myanmar waters and listed on IUCN Red List as species of conservation concern include Irrawaddy dolphin (*Orcaella brevirostris*) (Vulnerable), Indo-Pacific humpback dolphin (*Sousa chinensis*) (Near Threatened) and Indo-Pacific finless dolphin (*Tursiops aduncus*) (Vulnerable).

During exploration activities within A-6 trained crew on the drillship were used to record marine mammal sightings. During the Shwe Yee Htun-1 drilling program from 27 November 2015 to 17

(28) Julius Kyaw, Department of Fisheries, Present Status of Off-shore Fishery Resources and Information on Tuna Fishery in Myanmar, Special Meeting on Improvement of Tuna Information and Data Collection in the Southeast Asia7-9 September, 2011. Songkhla Province, Thailand.

(29) IUCN Red List. Search for Marine Mammal Species in Myanmar Marine Environment. Available from **http://www.iucnredlist.org/search** accessed April 2016

(30) ASEAN Agreement on the Conservation of Nature and Natural Resources. Kuala Lumpur, 9 July 1985

January 2016 (52 days), no marine mammals were sighted and recorded by the drillship vessel crew [31].

During the 52 day seismic survey conducted in A-6 in 2016, dedicated MMOs recorded the following sightings:

- Two sperm whales (*Physeter microcephalus*) (species vulnerable on the IUCN Red List);
- One Bryde's whale (*Balaenoptera brydei*) (species data deficient IUCN Red List);
- Four Risso's dolphins (*Grampus griseus*) (species of least concern, IUCN Red List);
- Six spinner dolphins (*Stenella longirostris*) (species data deficient IUCN Red List);
- One pantropical spotted dolphin (*Stenella attenuata*) (species of least concern, IUCN Red List);
- 14 additional unknown species dolphin sightings;
- Three additional unknown species baleen whales sightings; and
- One additional unknown species large whale sighting.

Of the species observed, one; the sperm whale (*Physeter macrocephalus*) is listed as a species of conservation concern of the IUCN Red List.

Information on sightings of marine mammal species collected from scientific surveys and stranding information is presented in *Figure 5.7* [32].

Sirenians (Dugongs)

Dugongs (*Dugong dugon*) inhabit shallow and sheltered coastal waters. Along with the Irrawaddy dolphin; dugong are also protected under the Myanmar Protection of Wildlife and Conservation of Natural Areas Law since 1994 under the category "completely protected". Given their preference to nearshore/coastal areas, dugongs are not expected to be present in the Project Area (about 21 miles from the coastline).

(31) No dedicated marine mammal observers were required to be deployed for the drilling as the rig was stationary during the activity

(32) Data collected from 1. Tun T, Langakoon AD, PE MT (2010) Dugong in Man Aung Water, Myanmar. Preceedings of the 5th International Symposium on SEASTAR 2000 and Asian Bio*logging Science (The 9th SEASTAR2000 workshop): 63 * 66 and Smith BD, Thant UH, Lwin JM and Shaw CD (1997) Investigation of cetaceans in the Ayeyarwady River and northern coastal waters of Myanmar. Asian Marine Biology (14): 173 * 194

Common Name	Latin Name	IUCN Red List
Baleen Whales		
Bryde's whale	*Balaenoptera edeni*	Data Deficient
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Least Concern
Toothed Whales		
Blainville's beaked whale	*Mesoplodon densirostris*	Data Deficient
Dwarf sperm whale	*Kogia sima*	Data Deficient
False killer whale	*Pseudorca crassidens*	Data Deficient
Killer whale	*Orcinus orca*	Data Deficient
Melon-headed Whale	*Peponocephala electra*	Least Concern
Pygmy killer whale	*Feresa attenuata*	Data Deficient
Pygmy sperm whale	*Kogia breviceps*	Data Deficient
Short-finned pilot whale	*Globicephala macrorhynchus*	Data Deficient
Sperm Whale	*Physeter macrocephalus*	Vulnerable
Porpoise and Dolphins		
Dwarf Spinner Dolphin	*Stenella longirostris roseiventris*	Data Deficient
Indo-pacific bottlenose dolphin	*Tursiops aduncus*	Data Deficient
Indo-pacific finless porpoise	*Neophocaena phocaenoides*	Vulnerable
Indo-pacific humpbacked dolphin	*Sousa chinensis*	Near Threatened
Irrawaddy dolphin	*Orcaella brevirostris*	Vulnerable
Pantropical spotted dolphin	*Stenella attenuata*	Least Concern
Rissos dolphin	*Grampus griseus*	Least Concern
Spinner dolphin	*Stenella longirostris*	Data Deficient
Striped dolphin	*Stenella coeruleoalba*	Least Concern
Sirenian		
Dugong	*Dugong dugon*	Vulnerable

Photo by Amila Tennakoon

Photo by Amila Tennakoon

Photo by Adam Li

Photo by NOAA

Photo by Keith Mullin.

Photo by Amila Tennakoon

Photo by Aude Steiner

Photo by Dan Keohl

Photo by Alexander Vasenin

Photo by Mike Baird

Photo by NOAA

Photo by Julien Willem

Figure 5.6

Marine Mammal Species in Waters of Ayeyarwady Region

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5.4.7 Marine Turtles

Five species of marine turtles, all of which are IUCN-listed threatened species are reported for the Myanmar waters (*Figure 5.8*). These are the olive ridley turtle (*Lepoidochely olivacea*) (Endangered), loggerhead turtle (*Caretta caretta*) (Endangered), green turtle (*Chelonia mydas*) (Vulnerable), hawksbill turtle (*Eretmochelys imbricata*) (Critically Endangered), and the leatherback turtle (*Dermochelys coriacea*) (Endangered). UNEP data suggest that olive ridley turtles may be nesting along the Ayeyarwady coastline bordering the northeast of A-6. During the 2016 seismic survey in the offshore waters of A-6 there were five observations of olive ridley sea turtles (*Lepidochelys olivacea*; Vulnerable) and three observations of unidentified sea turtles. These data also suggest green turtles may nest in the vicinity of marine beaches along Pathein and Thabaung Township (*Figure 5.7*).

All five species share similar life cycle characteristics, which include migration from foraging areas to mating (inter-nesting) and nesting areas [33]. In general, mature adult turtles (about 30 to 50 years old) undertake the migration from their coastal shallow benthic foraging areas to shallow water inter-nesting areas waters near nesting beaches every two to eight years. On arrival, turtles mate and females may nest multiple times at about two week intervals before returning to foraging areas. Eggs hatch after eight to ten weeks of incubation with hatchings dispersing into the open ocean surface waters where they forage for the next five to 20 years.

There is information available from the Ministry of Livestock and Fisheries on turtle nesting from Diamond Island (Thameehla) in the Ayeyarwady Region over 62 miles (100 km) south-east of A-6. These data was collected from 1986 to 2004 and demonstrates a positive relationship between number of eggs laid and number of hatchlings released [34]. The number of nests, eggs laid and the total number of unhatched, damaged and hatched eggs is presented in *Table 5.1*. Diamond Island is the largest recorded concentration of nesting in Myanmar where about 20,000 – 30,000 green turtle eggs and 7000 – 15,000 loggerhead turtle eggs are laid annually according to the DoF [35]. Green turtle nesting numbers at Thameehla Island is estimated at a few tens of nesting females per year [36].

Table 5.1 Turtle Nesting Data from Ayeyarwady Region (1986 to 2004)

Year	No of Nests	Eggs Laid	Unhatched Eggs	Damaged Eggs	Hatchlings Released	Hatching Rate (%)
1986	106	5200	-	4230	970	18.65
1987	528	16,073	5890	2114	8069	50.2
1988	297	27,900	2650	15,161	10,089	36.16
1989	549	66,908	27,294	4583	35,031	52.36
1990	537	52,300	7321	-	44,979	86
1991	359	34,334	7395	-	26,939	78.46
1992	369	36,900	7558	7413	21,929	59.43

(33) Miller JD 1997. Reproduction in sea turtles, In: Lutz, P, and Musick, JA (eds), The Biology of Sea Turtles, pp. 51-82, Boca Raton, CRC Press Inc

(34) Sea Turtle (Chelonia mydas) Nesting and Conservation Activity in Thameehla Island, Myanmar by Maung Maung Lwin at the Ministry of Livestock and Fisheries.

(35) John B. Thorbjarnarson, Steven G. Platt, and Saw Tun Khaing. Sea Turtles in Myanmar: Past and Present. Marine Turtle Newsletter 88:10-11, © 2000.

(36) Limpus, C. 2012. Assessment of turtle conservation actions at Thameehla Island. Report addressed to the Department of Fisheries, Myanmar.

Year	No of Nests	Eggs Laid	Unhatched Eggs	Damaged Eggs	Hatchlings Released	Hatching Rate (%)
1993	540	47,902	3143	10,036	34,723	72.49
1994	387	34,461	3987	-	30,474	88.43
1995	419	39,613	4516	3533	31,564	79.68
1996	463	45,928	3767	5317	36,844	80.22
1997	456	47,312	5138	1689	40,485	85.57
1998	306	30,679	3664	2065	24,950	81.33
1999	136	13,651	1888	-	11,763	86.17
2000	231	45,673	2201	-	43,472	95.18
2001	402	46,680	3090	-	43,590	93.38
2002	122	11,549	1821	595	9133	79.09
2003	251	21,016	4711	5221	11,084	52.74
2004	165	14,347	3162	7764	3421	23.84
Total	**6,623**	**638,426**	**99,196**	**69,721**	**469,509**	**-**
Average	**349**	**33,601**	**5,511**	**5,363**	**24,711**	**68**

Turtle nesting is well known on the Islands around the Bogale River in the Ayeyarwady Region (over 62 miles (100 km) from the Project Area. In 2003, the DoF suggested that the annual number of nests is 300. Nesting records in the Ayeyarwady Region indicate three species: olive ridley (70%), loggerhead (20%) and green turtle (10%) [(2)]. Like other countries, Myanmar has a long tradition of turtle egg collection for human consumption, which is one of the main threats to turtle populations in the region [(37)] [(38)].

Annual turtle nesting activity for coastal locations of Ayeyarwady Region is reported to occur between September and March. Given the location of the Project Area in relation to known nesting beaches, there is a potential for marine turtles to be present within the Project Area when traversing open waters to and from seasonal nesting areas and adjacent mating areas. All known nesting beaches are outside the Project Area.

(37) Thorbjarnarson JB, Platt SG and Saw Tun Khaing 2000. Sea turtles in Myanmar: Past and Present. Marine Turtle Newsletter 88:10-11. Available at: http://www.seaturtle.org/mtn/archives/mtn88/mtn88p10.shtml

(38) Shanker K and Pilcher NJ 2003. Marine turtle conservation in south and southeast Asia: Hopeless cause or cause for hope? Marine Turtle Newsletter 100:43-51. Available at :http://www.seaturtle.org/mtn/archives/mtn100/

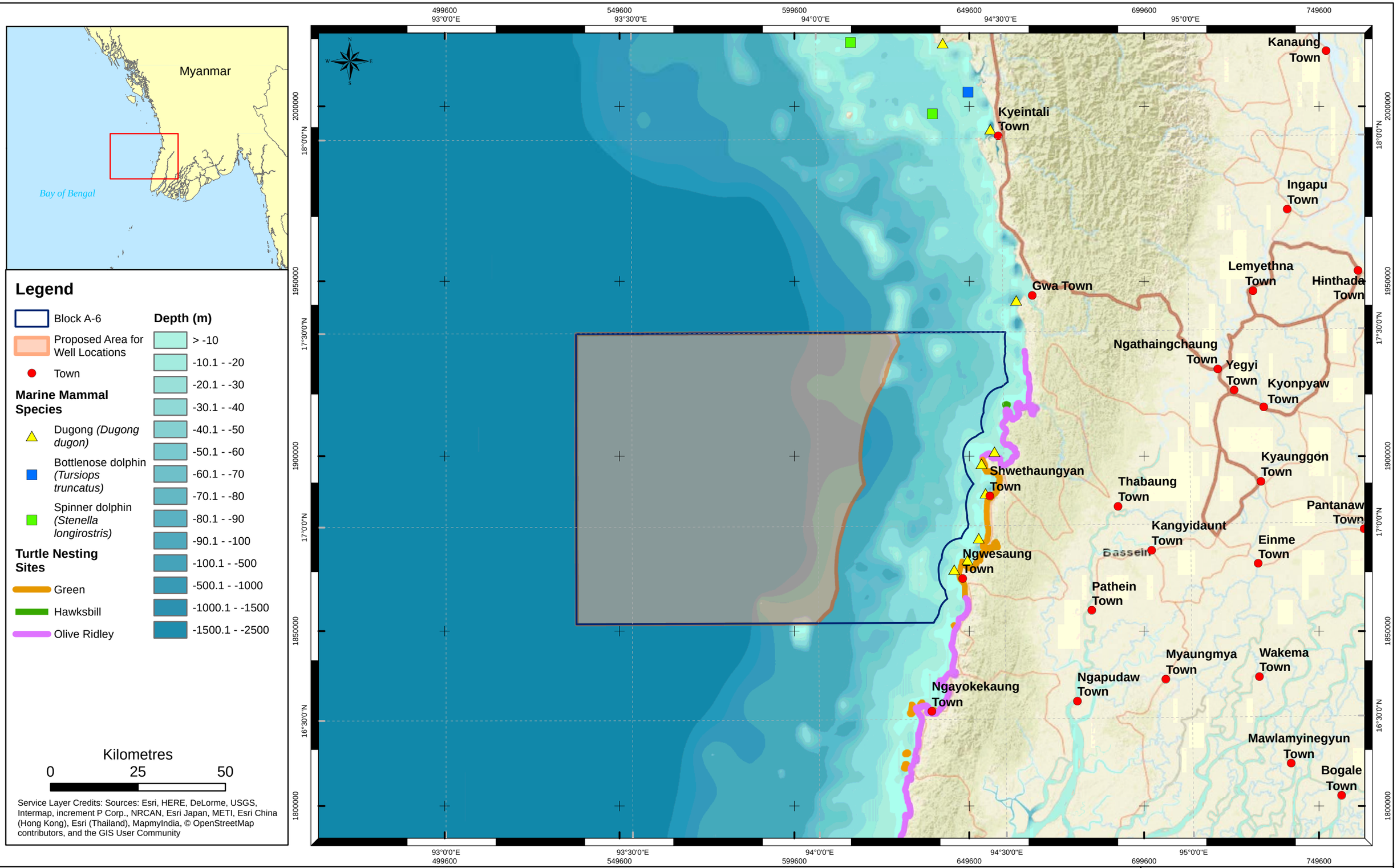

Figure 5.7

Turtle Nesting Beaches and Marine Mammal Sightings in the Study Area

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Date: 1/8/2016

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Latin Name	Common Name	Myanmar Name	IUCN Status	Potential Presence in Block A-6
Lepoidochely olivacea	Olive ridley turtle	*Leik Lyaung*	Endangered	Known to be nesting in Ayeyarwady Region and likely to be present in Block A-6.
Caretta caretta	Loggerhead turtle	*Leik Khway*	Endangered	Not known to nest in Ayeyarwady Region
Chelonia mydas	Green turtle	*Pyin Tha Leik*	Vulnerable	Known to be nesting in Ayeyarwady Region and likely to be present in Block A-6.
Eretmochelys imbricata	Hawksbill turtle	*Leik Kyet Tu Yway*	Critically Endangered	Known to be nesting in Ayeyarwady Region and likely to be present in Block A-6.
Dermochelys coriacea	Leatherback turtle	*Leik Zaung Lyar*	Endangered	Have historically been recorded in Ayeyarwady waters but are now considered rare.

Olive Ridley Turtle

Photo by Bernard Gagnon

Loggerhead Turtle

Photo by NOAA

Green Turtle

Photo by P. Lindgren

Hawksbill Turtle

Photo by US Fish and Wildlife Service Southeast Region

Leatherback Turtle

Photo by US Fish and Wildlife Service Southeast Region

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Figure 5.8

Marine Turtles in Waters of the Ayeyarwady Region

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5.4.8 Seabirds

Terns are the most abundant group of seabirds in offshore Myanmar waters, of which 13 species regularly occur. Other seabirds which may use these waters include gulls, storm petrels, jaegers (also known as Skuas), tropic birds, boobies, noddies and frigatebirds. Seabird species tend to be highly migratory, far ranging and widely distributed away from breeding areas. Offshore Myanmar waters are used by seabirds for foraging and resting. Islands and islets can also be used for roosting, resting and moulting. Only two species, the little tern (*Sterna albifrons*) and the brown booby (*Sula leucogaster*), are reported to have breeding colonies in Myanmar. There are no Important Bird or Key Biodiversity Areas [(39)] designated for birds known to occur in the Project Area.

The distribution range of one IUCN listed threatened seabird species, the Christmas Island frigatebird (*Fregata andrewsi*) (Critically Endangered) extends as far as Myanmar waters. However, Myanmar waters are at the outer limit of its range. Given this and its rarity, the potential for the occurrence of this seabird in the Project Area is considered low. Although detailed data on distribution, abundance, habitat utilisation and seasonality of seabirds specific to the Area of Influence are currently limited, it can be conservatively assumed that seabirds may be expected to occasionally pass within or close by A-6.

5.4.9 Protected and Environmentally Sensitive Areas

Information from Istituto Oikos and BANCA (2011) reported a total of 43 designated or proposed protected areas with IUCN categories exist for Myanmar [(40)]; however none of these lie within A-6 and the closest is on land (Rakhine Yoma Elephant Range) and over 62 miles (100 km) away.

There is an identified Key Biodiversity Area (KBA), Ngwe Saung, for this region of Ayeyarwady and it overlaps with the shallow waters of A-6 (*Table 5.*2). The Ngwe Saung marine KBA (#107) is defined spatially as an area 411 km^2 extending from the mainland coast and encompassing nearshore and offshore waters to about 22 km from the Myanmar coastline. This KBA is located about 8 miles (13 km) from the Project Area in which the proposed wells will be drilled. The sensitive receptors identified for the KBA were:

- Two marine turtle species, green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*), marine turtle species of conservation concern as listed on the IUCN Red List, Endangered and Critically Endangered , respectively; and
- Potential (queried) record of mangrove habitat.

The actual location of these species and the mangrove habitat within the KBA were not defined but assumed to be associated with nearshore locations. This KBA was one of 132 identified and is ranked as being of medium priority based on assessed level of threats. The KBA approach is a tool to identify, assess and prioritise sites of global biodiversity significance. The full list of KBAs was initially identified and updated based on stakeholder interviews, expert consultation and a literature review and finalised at a stakeholder workshop held in 2012 [(41)]. KBAs in Myanmar do not have any legal protection. There are 43 legally Protected Areas in Myanmar consisting of 35 designated and eight proposed areas; the Ngwe Saung KBA does not overlap with these areas [(42)].

Locations of known marine KBAs in the Study Area are shown in *Figure 5.9*. There are no marine protected areas (proposed or established) within the Study Area. One of the experts consulted with regards to the KBAs was U Aung Mo Chit who Woodside consulted with on the 9 September 2016

(39) An Important Bird and Biodiversity Area (IBA) is an area recognised by Birdlife International as being globally Important habitat for the conservation of birds populations.

(40) It should be noted that some of the locations are proposed as protected area without authorised designation (i.e. “soft” designation).

(41) Wildlife Conservation Society (2013). Myanmar Biodiversity Conservation Investment Vision. Wildlife Conservation Society, Yangon, Myanmar

(42) Istituto Oikos and Banca, 2011. Myanmar Protected Areas: Context, Current Status and Challenges

for this Project. He mentioned that his field observations (date unknown) did not record marine turtles but two dugong sightings [43].

Table 5.2 Key Biodiversity Areas (Marine) in Study Area

Name	Area	Key species and IUCN Status	Distance from A-6
Ngwe Saung	158 sq. miles (411 km^2)	Hawksbill turtle (critically endangered), green turtle (endangered) and mangrove habitats.	Located within A-6 and eight miles (13 km) from the Project Area.
Maw She	86 sq. miles (222 km^2)	Hawksbill turtle (critically endangered), green turtle (endangered), loggerhead (vulnerable) and olive ridley (vulnerable).	Over 62 miles (100 km) from the Project Area.

Source: Key Biodiversity Areas in Myanmar from Wildlife Conservation Society. Available from **https://myanmarbiodiversity.org/key-biodiversity-areas/** and GIS data provided by WCS Myanmar

(43) Aung Mo Chit pers. comm

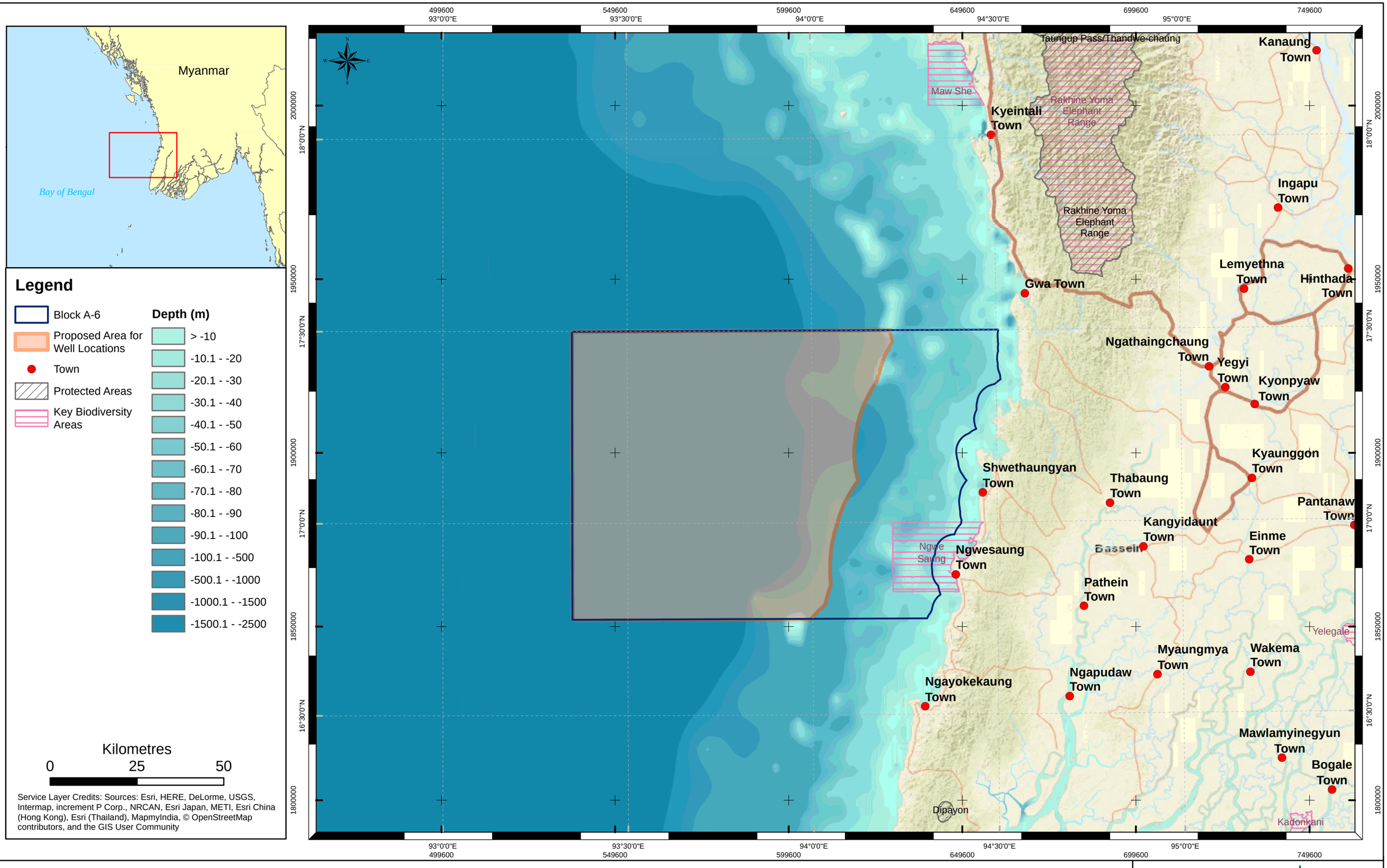

Figure 5.9

Protected Areas and Key Biodiversity Areas

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5.5 SOCIO-ECONOMIC CHARACTERISTICS

5.5.1 Administration and Demographics

The Ayeyarwady Region is located in south western Myanmar. It is bordered by the Bago and Yangon Regions in the northeast and east, the Rakhine State in the northwest, and the Bay of Bengal and Andaman Sea to the west and south. *Table 5.3* provides an understanding of the demographic profile of the region.

Table 5.3 Administrative and Demographic Profile of the Ayeyarwady Region, as of 2013 (44)

Attribute	Ayeyarwady
Districts	6
Townships	26
Wards	219
Village Groups	1912
Villages	11651
Total Population	8,041,084
Area (sq. km)	35,032
Population Density (persons per sq. km)	230
Females per thousand males	1052
Average Household Size	4.1
Rural Population %	85.9
Urban Population %	14.1

The region is amongst the three most highly populated regions in the country along with Mandalay and Yangon and contributes about 15% of the total population of the country. It is the tenth largest region in the country in terms of surface area covering about 5% of the country's total surface area. Ayeyarwady Region is reported to be comprised of the social groups such as Bamar, Karen/Kayin and Rakhine. Of these, the Bamars are reported to be the majority while the Rakhine are reported as the minority group, primarily found in the western coastal regions (45). In terms of religion, it is characterized by a majority of Buddhist, followed by Christians and Muslims.

The region is also one of the most rural regions in the country, with the urban population comprising only about 14.1% of the total population. The average household size, as of 2013, in the region is 4.1 people, which is significantly lower than the national average of 4.4 (46).

5.5.2 Livelihood and Economy

Rice cultivation and fishing are the main economic activities of the Ayeyarwady Delta and are reported to play a critical role in the economy and livelihood of the region, with rice cultivation and fishing dominating the economic activities, especially in the rural areas (47). The sectors of industry,

(44) Ayeyarwady Delta Final Report.

(45) Delta Alliance (2013). Vulnerability and Resilience Assessment, Ayeyarwady Delta, Myanmar

(46) UNDP: Local Governance Mapping: The State of Local Governance: Trends in Ayeyarwady (2013)

(47) Ayeyarwady Delta, Delta Alliance (December 2013)

infrastructure and services are smaller in scale, primarily due to the remoteness and status of development in the area.

The following sub sections provide an understanding of the main livelihood activities in the region, namely agriculture and fishing.

5.5.3 Tourism

There are a number of tourist attractions on the coastline adjacent to the Project Area. The two main areas are Ngwe Saung Beach, located approximately 30 miles (48 km) west of Pathein city and Chaungthar Beach, located approximately 25 miles (40km) to the west of Pathein city. These contain a mix of high end luxury resort accommodation, mid-range hotels and budget hostels. The peak tourism period is between October and May due to the monsoon period [48]. To inform this section, the Department of Tourism in Chaungthar and Ngwe Saung was contacted for information. This details provided are given below.

In Ngwe Saung, the main tourist attractions are: the beaches; Bird Islands (8 miles (12.9 km) west of Ngwe Saung) which is popular for scuba diving and fishing; Thazin fishing village; Snake Island located 3.5 miles (5.6 km) west of Ngwe Saung; Sin Ma Fishing village; and Love Island to the south (8 miles (12.9 km) from Ngwe Saung). There is also an elephant camp (18 miles (29 km) to the east of Ngwe Saung) where there is accommodation for people to stay and view elephants [49].

In Chaungthar, the main tourist attractions are Chaungthar Beach, and the Stone Brother and Sister beaches (4 miles (6.4 km) north of Chaungthar) where the Stone Brother and Sister Pagoda are located. To the east of Chaungthar is Pathein Township, from where a boat cruise along Ooto Creek originates. The Ooto Elephant Camp will be opening soon and will be located 26 miles (42 km) from Chaungthar. There is also an island close to the shore called White Sand Island which is popular for beach tourists. To the north is South- Aung Mingalar / Phyo Kalar Island where the Kyauk Po Htoo Pagoda is located, just across the Ooto Creak from Chaungthar[50].

Figure 5.10 provides an overview of tourism in the region.

5.5.4 Fishing Operations and Resources

The DoF at the national level controls offshore fishing activities and licences, while inshore licences are granted at the state level. The DoF has established a legal framework with strategies and policies for sustainable development and management of marine fisheries. These include licencing, prescription of exploitable species, designation of environmental friendly fishing gears and methods, and the imposition of closed areas and seasons. The DoF fishing licence blocks are shown in *Figure 5.11.*

The DoF has instituted two fishing zones which provide a restriction on fishing activities and a degree of protection to fisheries resources. Fishing Zone 1, for inshore fishing, extends from the shoreline to 10 nm (11.5 miles, 1.8 km) in the northern area including Ayeyarwady coastal areas. Fishing Zone 2 extends from the outer limit of Fishing Zone 1 to the 200 nm (230 miles, 370 km) Exclusive Economic Zone limit. Fishing vessels are classified as commercial or traditional. Commercial offshore fishing vessels use long lines, trawl nets, purse seines, drift nets and gill nets. Traditional inshore fishing vessels use methods such as hook-and-line, cast net, bag net, gill net, lift net and traps. In 2012–2013, about 1900 licenced offshore commercial vessels and 24,500 licenced inshore traditional vessels operated in Myanmar waters. Total fisheries production in Myanmar for human consumption was about 1.9 million tonnes in 2012.

(48) Pers comm, U Soe Win, Staff Officer, Dept of Tourism

(49) Pers comm, U Soe Win, Staff Officer, Dept of Tourism

(50) Pers comm, Naing Aung, Staff Officer, Dept of Tourism

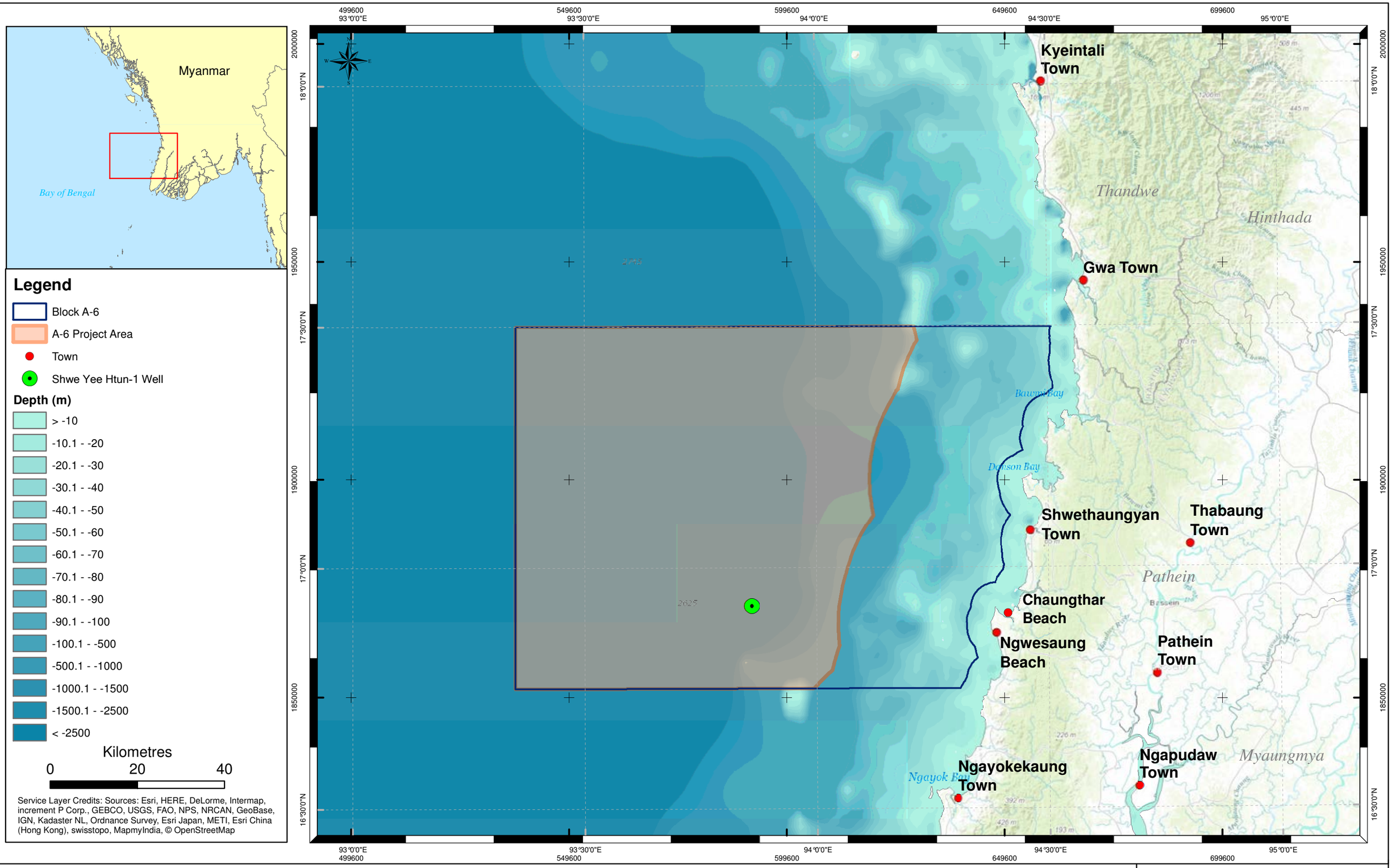

Figure 5.10

Location of Tourism Areas in Ayeyarwady Region

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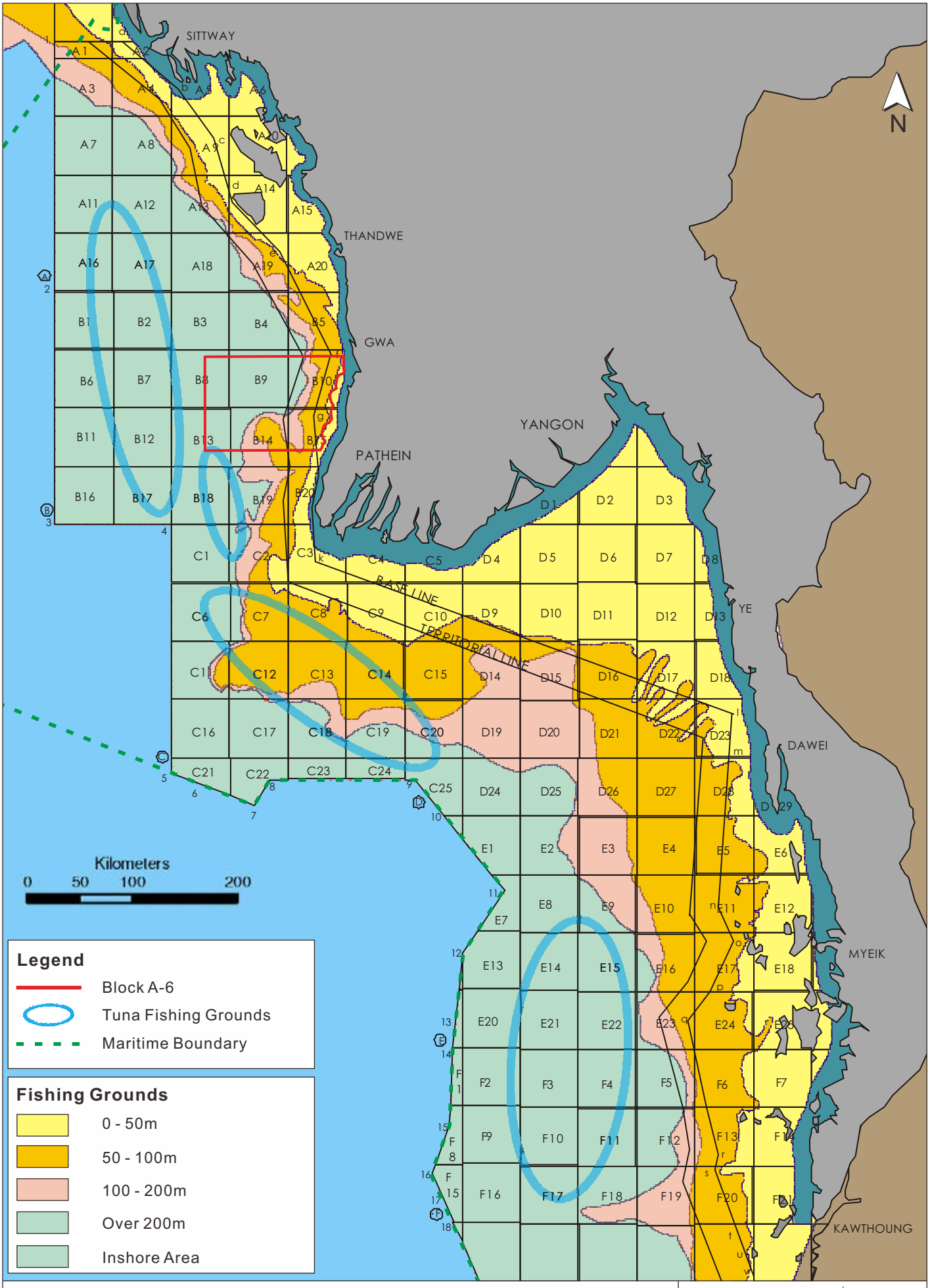

Figure 5.11 Fishing Blocks in the Waters of Ayeyarwady Region

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In Ayeyarwady Region, consultations in Pathein and Thabaung Township have been previously undertaken in 2015 as part of the Initial Environmental Examination studies for the seismic survey and previous exploration drilling activity in A-6. During these stakeholder meetings local fishermen noted that the majority of fishing is conducted in inshore areas (rivers) with some fishing out to 7 miles (11 km) from the coast; whereas the proposed drilling activities in A-6 will be located about 21 miles (35 km) offshore. However, there is the potential for large commercial trawlers and other offshore fishermen from throughout Myanmar to be within the waters of A-6. There were no fishing interactions during the 52 day drilling period in A-6 (27 November 2015 to 17 January 2016) which was also conducted in the Project Area of A-6 in which the proposed wells will be drilled. During the 2016 3D marine seismic survey, there were 18 fishing vessel sightings, and five fishing gear sightings recorded within and near A-6. No grievances were recorded. The majority of fishing equipment was found drifting in the ocean, with no apparent owner. The seismic survey was conducted in the southwest corner of A-6 (as shown in *Figure 5.12*) in a similar location to the Project Area. Of the vessels observed, the majority (~90%; 16 vessels) were deep sea gill netters and the remainder (2 vessels) were classified as long liners. These vessels are commonly used in Myanmar by offshore and / or commercial fishermen whereas local artisanal fishermen use methods such as hook-and-line, cast net, bag net and small trawls. Therefore, these vessels are highly likely to be offshore, commercial type vessels that come from throughout Myanmar and not from artisanal fishing from local communities. It should be noted that the seismic survey was conducted over a wider area than the drilling and the likelihood of encountering vessels is therefore reduced.

The peak season for fishing is from November to April as this is outside of the monsoon season. Fishing is still conducted during the monsoon season but this is generally within the nearshore fishing area; within 10 nm (11.5 miles, 18.5 km) of the coast.

A fishing focus group discussion was held in Chaungthar in June 2016 with offshore fishermen (i.e. those that fish out beyond 10 nm (11.5 miles, 18.5 km). They stated that they use mostly trawls or purse-seines to fish. They generally do not target a particular species and fish from September to May (avoiding the bad weather during the monsoon season in June to August). The larger purse seine vessels are equipped with Global Positioning System (GPS) navigational systems and use radio offshore to communicate their position. Information on the vessels and fishing activities undertaken in presented in *Table 5.4* and *Table 5.5*.

Table 5.4 Baseline Understanding of Fishing within the Area of Influence

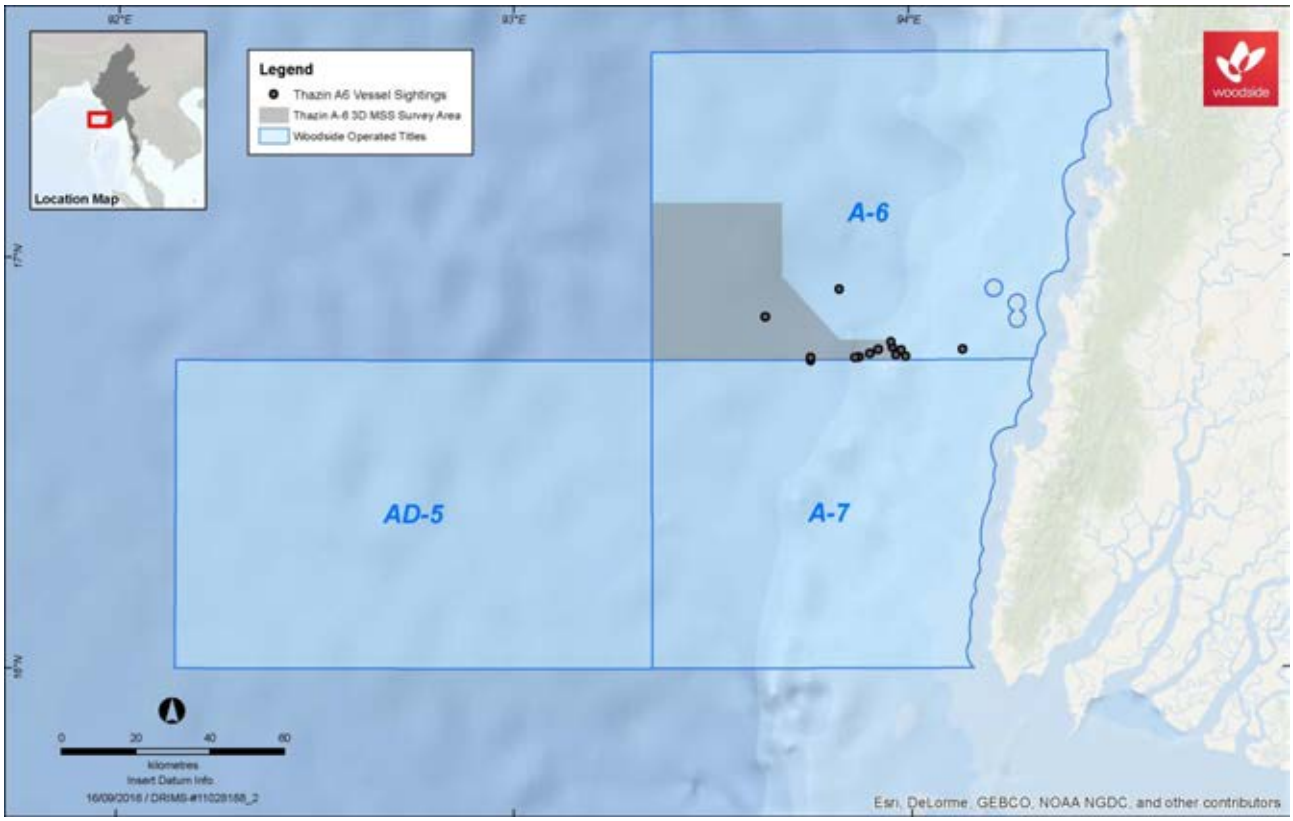
Type of Boats	Size	Motor capacity	Distance covered (units)	Usually moves in Depth of (units)	Average fishing trip (time spent at sea)
Large / offshore (trawler)	29 ft	20 HP	7 miles (11.3 km) from coast	197 ft (60 m)	3–4 days
Large / offshore (purse seine vessel)	> 90 ft	32-45 HP	<30 miles (50 km) from coast	240 ft (73 m)	30 days

Table 5.5 Seasonality of Fishing in Waters of the Ayeyarwady Region

FISHING CALENDAR	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Months with Maximum Fish Catch (quantity (tonnes) caught)	■	■	■	■	■				■	■	■	■
Months with lowest fish catch (quantity (tonnes) caught)						■	■	■				
Fishing reduced due to Cyclones or high tides					■							
Fishing restricted by Government						■	■	■				

The majority of fishing is conducted within 10 nm (11.5 miles, 18.5 km) of the coast and the Project Area is located about 21 miles (35 km) from the nearest coastline, there are unlikely to be any interactions between local artisanal fishing vessels and the Project activities. However, it was noted that large commercial purse seine and other fishing vessels including those from other areas of Myanmar (Mon State, Rakhine State and Tanintharyi Region) may operate within the deep offshore waters of Ayeyarwady. Although there were no interactions with local artisanal fishers and offshore commercial fishing vessels during the previous drilling of Shwe Yee Htun-1, it is conservatively assumed there may be potential interactions between the proposed drilling activities and offshore commercial fishing vessels. As such, the assessment of impacts on fishing will be limited to offshore, fishing vessels which may be in the Project Area.

Figure 5.12 Vessel Sightings during 2016 3D Marine Seismic Survey



5.5.5 Shipping Lanes

From available ship frequency tracking data, the Bay of Bengal has relatively limited shipping activity with lightly used shipping lanes from ports in the north (Kolkata, Chittagong etc.) heading to the southern tip of India and the Straits of Malacca in the south [51] (*Figure 5.13*). The south-west corner of A-6 overlaps with this shipping lane but A-6 is not located in the section most frequently used navigation route for shipping. There were no interactions with shipping vessels during the previous drilling program in Shwe Yee Htun-1 and the marine seismic survey in A-6 in early 2016. Potential interactions between the proposed drilling program activities and shipping traffic could, however, occur and have been considered as part of the assessment.

(51) Marine Traffic Website, shipping density maps. Accessed from http://marinetraffic.com/ in August 2015

5.5.6 Other Petroleum Exploration and Production

The region currently supports a number of industries including petroleum exploration and production. With the lifting of international sanctions, licencing has begun on a number of offshore oil and gas Licence Blocks in Myanmar. In 2014, the Ministry of Energy (MOE) (now known as MOEE) announced that ten shallow water and ten deep water Blocks had been awarded in Myanmar waters [52]. The majority of the operators of these Blocks commenced exploration activities (seismic surveys and exploration drilling) in 2015 and some are planning on conducting further exploration activities in 2016/2017. The activities undertaken at the same time as the Project will be considered in terms of cumulative impacts.

The license Blocks awarded in 2014 within the Rakhine Basin are listed in *Table 5.6*.

Table 5.6 Blocks Licensed in 2014 in the Rakhine Basin

Block	Operators
Shallow water	
A-4	BG Group and Woodside Energy (Myanmar)
A-5	Chevron (Unocal Myanmar Offshore Co. Ltd.
A-7	BG Group and Woodside Energy (Myanmar)
Deep Water	
AD-2	BG Group and Woodside Energy (Myanmar)
AD-3	Ophir Energy PLC
AD-5	BG Group and Woodside Energy (Myanmar)
AD-9	Shell Myanmar Energy and MOECO
AD-10	Statoil and ConocoPhillips
AD-11	Shell Myanmar Energy and MOECO

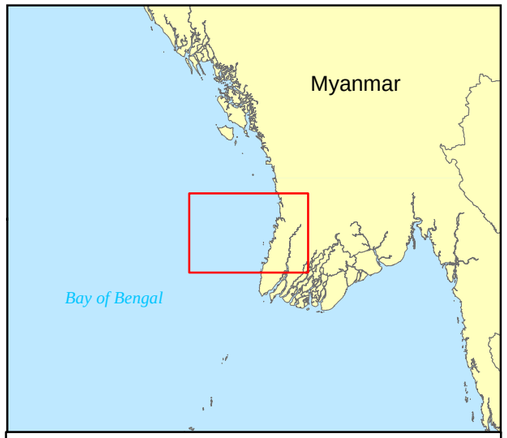
5.6 CULTURAL CHARACTERISTICS

No known offshore sites of culture heritage occur within the Project Area. There are numerous pagodas along the coastline neighbouring A-6 such as the Twin Pagodas on Ngwe Saung Beach which are located about 21 miles (35 km) from the Project Area. Given the distance from the Project Area; there will be no impacts on this site from Project Activities.

5.7 VISUAL CHARACTERISTICS

The Project Area is located about 21 miles (35 km) from the nearest coastline, as such the MODU will not be visible from the coast and there will be no visual impacts on coastal communities and other onshore receptors. It should also be noted that the MODU will be temporarily located in one position and is not a permanent structure.

(52) Oil and gas Journal, online. Myanmar awards exploration blocks. Available at **http://www.ogj.com/articles/2014/03/myanmar-awards-exploration-blocks.html**



Legend

- Block A-6
- Proposed Area for Well Locations

Kilometres
0 50 100

199600 90°0'0"E
399600 92°0'0"E
599600 94°0'0"E
799600 96°0'0"E
2200000 20°0'0"N
2000000 18°0'0"N
1800000

Whaikhyang
Mrauk-U
Sittwe
Meiktila
Magway
Navpyita
Lewe
Lay Taung Tha Yet Cho
Pyay
Thandwe
Hinthada
Ngwesaung
Pathein
Myaungmya
Dala

Figure 5.13

Shipping Lanes Crossing A-6

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Date: 1/8/2016

Environmental Resources Management

ERM

6 IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

This section presents the environmental and social impact assessment methodology and, where appropriate, recommended mitigation measures to reduce or avoid potential impacts. The impact assessment methodology provides a basis to characterise the potential environmental and social impacts of the Project and is based on models commonly employed in impact assessment, taking into account good international practice.

Potential impacts arising from both planned (routine and non-routine [53]) activities and unplanned events are assessed. Unplanned events are those not anticipated to occur during the normal course of the Project activities, for example a vessel collision resulting in a spill of fuel or damage to a fishing boat.

This Project consists only of an operations phase. There are no construction or decommissioning related phases. At the end of Project activities, the MODU and all Project vessels will depart the Project Area. As such, this impact assessment is conducted for the operations phase only.

6.1 IMPACT ASSESSMENT METHODOLOGY AND APPROACH

The principal impact assessment steps are summarised in *Figure 6.1* and comprise:

- **Impact prediction**: to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities.
- **Impact evaluation**: to evaluate the significance of the predicted impacts by considering their magnitude or likelihood of occurrence (for unplanned events), and the sensitivity, value and/or importance of the affected resource/receptor.
- **Mitigation and enhancement**: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- **Residual impact evaluation**: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures. Major impacts are considered "significant" in *Figure 6.1*.

(53) Routine activities are those preformed on a frequent basis and planned in the Project Design. No routine activities are those undertaken infrequently and may not be planned in the Project Design.

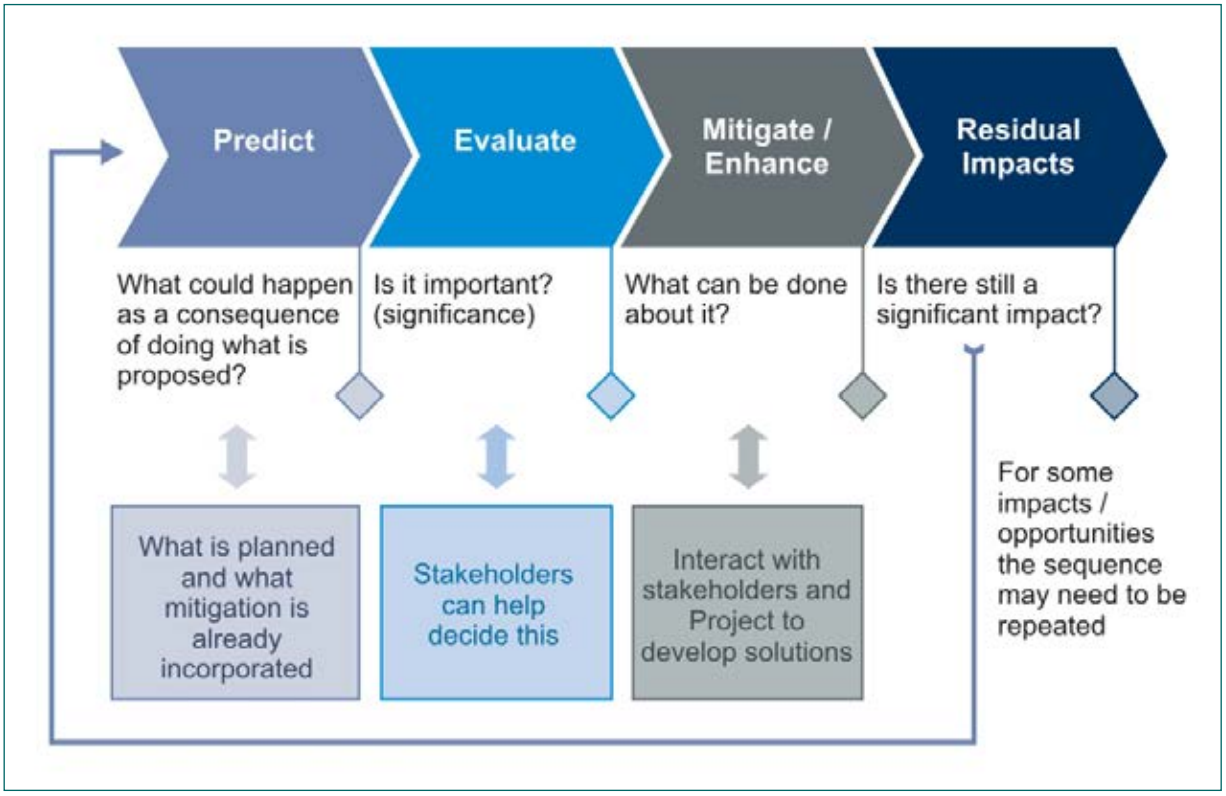

Figure 6.1 Impact Assessment Process

6.1.1 Prediction of Impacts

Prediction of impacts is an objective exercise to determine what could potentially happen to the sensitive receptors/resources as a consequence of the Project activities. From these potential interactions, the potential impacts to the various resources/receptors are identified and are elaborated to the extent possible. The assessment process typically utilises a wide range of prediction methods including quantitative, semi-quantitative and qualitative techniques.

6.1.2 Evaluation of Impacts

Once the prediction of impacts is complete, each impact is described in terms of its relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology used to describe impact characteristics is shown in *Table 6.1.*

Table 6.1 Impact Characteristic Terminology

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	Direct, Indirect, Induced
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several km, etc.).	Local, Regional, International
Duration	The time period over which a resource / receptor is affected.	Temporary, Short-term, Long-term, Permanent
Scale	The size of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.).	*[no fixed designations; intended to be a numerical value]*
Frequency	A measure of the constancy or periodicity of the impact.	*[no fixed designations; intended to be a numerical value]*

The definitions for the *type* designations are shown in *Table 6.2* and definitions for the other designations are resource/receptor-specific and are discussed in *Section 6.1.3*.

Table 6.2 Impact Type Definitions

Designations (Type)	Definition
Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g. sound from a seismic source such as a VSP leading to behavioural changes in marine fauna).
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g. reduction in water quality from waste discharges potentially leading to effects in marine fauna).
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is *likelihood*. The *likelihood* of an unplanned event occurring is designated using a qualitative scale, as described in *Table 6.3.*

Table 6.3 Definitions for Likelihood Designations

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

6.1.3 Impact Magnitude, Receptor/Resource Sensitivity and Impact Significance

The next step is to assign each impact a 'magnitude' which is a function of a combination (depending on the resource/receptor in question) of the following impact characteristics: Extent; Duration; Scale; and Frequency.

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. The magnitude designations are: Positive; Negligible; Small; Medium; and Large.

In the case of a *positive* impact, no magnitude designation (aside from 'positive') is assigned.

The definitions for these designations vary on a resource/receptor-by-resource/receptor basis. The impact magnitude for marine species, marine habitats and water quality impacts is provided in *Table 6.4, Table 6.5, and Table 6.6* respectively. The impact magnitude criteria for the social impact assessment are provided in *Table 6.7*.

Table 6.4 Impact Magnitude for Marine Species

	Extent / Duration / Scale / Frequency
Large	May affect an entire population or species in sufficient magnitude to cause a decline in abundance and/ or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations.
Medium	May affect a portion of a population and may bring about a change in abundance and/ or distribution over one or more generations, but does not threaten the integrity of that population or any population dependent on it.
Small	May affect specific group of localised individuals within a population over a short time period (one generation or less), but does not affect the population itself.
Negligible	Immeasurable, undetectable or within the range of normal natural variation.

Table 6.5 Impact Magnitude for Marine Habitats

	Extent / Duration / Scale / Frequency
Large	May affect the integrity of an area or region, by substantially changing, in the long term, its ecological features, structures and functions, across its whole area, that enable it to sustain the habitat, complex of habitats and/or population levels of species that makes it important.
Medium	May affect some, if not all, of the area's ecological features, structures and functions in the short or medium term. The area or region may be able to recover through natural regeneration and restoration.
Small	May cause some minor impacts of limited extent, or to some elements of the area, are evident but easy to recover through natural regeneration.
Negligible	Immeasurable, undetectable or within the range of normal natural variation.

Table 6.6 Impact Magnitude for Water Quality

	Extent / Duration / Scale / Frequency
Large	Change in water quality over a large area that lasts over the course of several months with quality likely to cause secondary impacts on marine ecology; and/or Routine exceedance of benchmark effluent discharge limits.
Medium	Temporary or localised change in water quality with water quality returning to background levels thereafter; and/or Occasional exceedance of benchmark effluent discharge limits.
Small	Slight change in water quality expected over a limited area with water quality returning to background levels within a few metres; and/or Discharges are well within benchmark effluent discharge limits.
Negligible	Immeasurable, undetectable or within the range of normal natural variation.

Table 6.7 Impact Magnitude for Local Communities, Fishermen and Other Marine Users

	Extent / Duration / Scale / Frequency
Large	Affects the majority of the area or population in the Study Area and/or persists over many years. The impact may be experienced over a regional or national area.
Medium	Clearly evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional and impact may potentially be regional in scale.
Small	Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Negligible	Change remains within the range commonly experienced within the household or community.

The other principal impact evaluation step is definition of the sensitivity (including vulnerability and importance) of the impacted resource/receptor. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value.

As in the case of magnitude, the sensitivity designations themselves are universally consistent, however, the definitions for these designations vary on a resource/receptor basis. The universal sensitivity/vulnerability/importance designations are: Low; Medium; and High.

The receptor sensitivities for marine species, marine habitats and water quality are provided in *Table 6.8*, *Table 6.9* and *Table 6.10*, respectively. The receptor sensitivity criteria for the social assessment are provided in *Table 6.11*.

Table 6.8 Receptor Sensitivity for Marine Species

Category	Designation / Importance / Vulnerability
High	A species population that has designated conservation status at an international scale (e.g. IUCN Red List). A species that is globally rare. A keystone species fundamental to the functioning of the ecosystem.
Medium	A species population that has designated conservation status at a national or regional scale. A species common globally but rare locally. Important to ecosystem functions or under threat or population in decline.
Low	A species not protected by law. Not critical to other ecosystem functions (e.g. as prey to other species or as predator to potential pest species) or common / abundant locally.

Table 6.9 Receptor Sensitivity for Marine Habitat

Category	Designation / Importance / Vulnerability
High	A habitat that has designated conservation status at an international scale (e.g. protected areas). Areas of particular biodiversity importance that may support populations of restricted range, endemic or endangered species, or is in itself unique or threatened.
Medium	A habitat that has designated conservation status at a national or regional scale. Areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.
Low	A habitat not protected by law. Areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.

Table 6.10 Receptor Sensitivity for Marine Water Quality

Category	Designation / Importance / Vulnerability
High	Existing water quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological or health impacts are likely).
Medium	Existing water quality already shows some signs of stress and/ or supports ecological resources that could be sensitive to change in water quality.
Low	Existing water quality is good and the ecological resources that it supports are not sensitive to a change in water quality.

Table 6.11 Receptor Sensitivity for Local Communities, Fishermen and Other Marine Users

Category	
High	Profound or multiple levels of vulnerability that undermine the ability to adapt to changes brought by the Project.
Medium	Some but few areas of vulnerability; but still retaining an ability to at least in part adapt to change brought by the Project.
Low	Minimal vulnerability; consequently with a high ability to adapt to changes brought by the Project and opportunities associated with it.

Once impact magnitude and resource/receptor sensitivity have been characterised, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in *Table 6.12.*

Table 6.12 Impact Significances

		Resource/Receptor Sensitivity		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The matrix applies universally to all resources/receptors as well as all impacts, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity designations that enter into the matrix. *Table 6.13* provides context for what the various impact significance ratings signify.

Table 6.13 Context of Impact Significances

Category	Context of Impact Significance
Negligible	An impact of Negligible significance is one where a resource/receptor will essentially not be affected or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.
Minor	An impact of Minor significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity. In either case, the magnitude should be well within applicable standards.
Moderate	An impact of Moderate significance has an impact magnitude at the upper level of applicable standards. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is ALARP. This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently
Major	An impact of Major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly sensitive resource/receptors. An aim of impact assessment is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the impact assessment process). An example of an embedded control is a standard acoustic enclosure that is designed to be installed around a piece of major equipment. This avoids the situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

6.1.4 Identification of Mitigation and Enhancement Measures

Once the significance of an impact has been characterised, the next step is to evaluate what control measures can be applied to eliminate, control or mitigate the risk to ALARP (54) and to determine if the risk level is acceptable.

The assessment process is intended to identify impacts and benefits associated with Project activities and ways of dealing with them during the planning and design stage of the Project. Planned mitigation measures will be described, and additional measures or controls will be recommended where impacts are still considered to be unacceptable. These mitigation measures have been utilised to develop the EMP. Note that, in accordance with the EIA Procedure, the EMP for the Project is presented as a separate document.

Many mitigation or control measures will require a degree of management to ensure their success in reducing potential impacts to the residual level that is expected through the EIA process. Most of these residual outcomes are likely to require a degree of monitoring through project implementation to ensure that the mitigation and management process is effective. It is these management and monitoring efforts that report to the EMP as part of the EIA process.

(54) As Low As Reasonably Practicable (ALARP) has been defined as an impact that is tolerable only if impact reduction is impracticable or if the effort involved in reducing the impact further would be grossly disproportionate to the benefit gained.

6.1.5 Residual Impact Evaluation

Once mitigation and enhancement measures are declared, the residual impact significance is identified (i.e. a repeat of the impact assessment steps discussed above). In some cases, it may only be possible to reduce the impact to a certain degree such as where an impact could not be completely avoided. All residual significant impacts are described in this report with commentary on why further mitigation is not feasible.

The degree of significance attributed to residual impacts is related to the weight that should be given to them in reaching a decision on the Project:

- Residual impacts of **Major** significance are considered to warrant substantial weight in the Project decision making process. Conditions should be imposed to ensure adverse impacts are controlled and monitored;
- Residual impacts of **Moderate** significance are considered to be of reducing importance to decision-making, however, still warrant careful attention to ensure best available techniques are used to keep adverse impacts to as low as is technically and financially feasible;
- Residual impacts of **Minor** significance should be brought to the attention of the decision-maker but are identified as warranting little if any weight in the decision; and
- Not significant residual impacts are those that, after assessment, are found not to be significant to the decision making about the Project.

6.1.6 Management and Monitoring

The final stage in the impact assessment process is defining the management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards; and b) mitigation measures are effective.

A summary of all actions which the Project Proponent has committed to are included in the separate EMP. The EMP includes mitigation measures, management and monitoring activities.

6.1.7 Cumulative Impact Assessment

While the impacts of an individual project may be judged to be acceptable, there is also a need to consider the potential for a project's impacts to interact with impacts associated with other developments – "cumulative" impacts. IFC PS 1 [(55)] defines cumulative impacts as:

"*Impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted*".

A CIA considers the residual impacts reported for the Project and evaluates these alongside potential impacts from other projects/activities that may affect common resources and receptors. The ultimate goal of this analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually.

The CIA will define the geographic and temporal boundaries to identify other relevant projects or activities which could interact with the Project. The cumulative assessment will be the same as the impact assessment. The CIA is presented in *Section 7.*

(55) IFC (2012) Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts. **http://www.ifc.org/wps/wcm/connect/3be1a68049a78dc8b7e4f7a8c6a8312a/PS1_English_2012.pdf?MOD=AJPERES**

6.2 IDENTIFICATION OF IMPACTS

Project risks and potential impacts have been identified through a systematic process whereby the activities associated with the Project have been considered with respect to their potential to interact with resources or receptors. Following screening, a scoping exercise was undertaken in order to clearly show the potential interactions between Project activities and physical, biological and social receptors. This was presented in a detailed Scoping Report submitted to MONREC on the 7 September 2016. The scoping matrix is presented in *Table 6.14.*

Entries in the matrix cells were then coloured to indicate whether:

- an interaction is not reasonably expected (white); or
- an interaction is credible but none of the resulting impacts are likely to lead to significant impacts and are therefore scoped out of the EIA with justification (grey); or
- an interaction is credible and at least one of the resulting impacts may lead to significant impacts and are therefore taken forward for assessment in the EIA (black).

For activities that are not predicted to result in an interaction with the receiving environment (i.e. those in white in the matrix), no detailed quantification or further assessment in this EIA has been conducted.

A summary of the impacts that were scoped out (i.e. in grey) during the Scoping Phase and are not considered in this EIA Report is provided in *Table 6.15.*

6.3 KEY POTENTIAL IMPACTS

The Scoping Report stated that the majority of identified potential impacts are not expected to be significant (i.e. those scoped out in *Table 6.14*). For activities predicted to have no significant impact, no detailed quantification or further assessment will be conducted in this EIA Report.

For interactions where possible significant impacts could occur, these interactions have been assessed in more detail within this EIA Report. Those interactions include:

- The contribution of GHG emissions arising from combustion emissions from the MODU, support vessels, machinery engines and flaring;
- Potential impacts from drill cuttings and drilling fluid discharge on water quality, sediment quality and pelagic and benthic communities;
- Increases in ambient underwater sound and generation of sound pressure levels from short duration VSP, causing disturbance to marine mammals, marine turtles and fish that may be present within the Project Area;
- Potential water contamination and secondary impacts to biodiversity and fishing activities from accidental spills or leaks (e.g. vessel collision, deck spills or during offshore re-fuelling) or the unplanned release of NADF;
- Short-term disturbance to commercial fishing activities and shipping/navigation within the Project Area due to the presence of the MODU and support vessels during drilling activities; and
- Potential impacts from unplanned collisions on fishing vessels and other marine users due to the presence of the MODU and support vessels during drilling activities.

Section 6.4 presents the detailed assessment of the key potential environmental and social impacts associated with the A-6 drilling program.

Table 6.14 Potential Interactions and Significance of Impacts to Receptors / Receivers from the Drilling Program in the Project Area

Project Activity/ Hazards	Sediment Quality	Seabed Features/ Profile	Air Quality	Marine Water Quality	Fish Communities	Planktonic Communities	Offshore Benthic Habitats and Communities	Nearshore Habitats and Communities	Marine Mammals	Marine Turtles	Seabirds and Shorebirds	Subsea Infrastructure	Public Health and Safety	Fisheries	Visual Amenity	Navigation/ Traffic and Transport
Planned Events																
Air emissions from MODU, support vessel(s) and machinery engines & flaring																
GHG emissions from MODU, support vessel(s) and machinery engines & flaring																
Vibration from drilling																
Presence of MODU and support vessels																
Routine offshore discharges																
Drilling cuttings and drilling fluid overboard discharge																
Sound from drilling, support vessel movements and mechanical equipment, helicopters																
Light emissions																
Generation of acoustic signals during VSP of the well																
Standard waste generation and disposal																
Unplanned Events																
Accidental hydrocarbon spills (including spills on deck, bunkering and vessel collision)																
Accidental loss of waste material																
Vessel collision with fishing and shipping																
Invasive marine species																
Dropped objects																
Well kick																
Well blowout																
Marine fauna collision																

Table 6.15 Scoped Out Impacts and Rationale

Impact	Rationale for scoping out of assessment
Planned events	
Impacts from air emissions from MODU, support vessel(s), machinery engines and on ambient air quality	Atmospheric emissions generated during the drilling program may arise from internal combustion engines on the MODU, support vessels and machinery engines resulting in the release of SO_2, NOx, ozone depleting substances, CO_2, particulates and volatile organic compounds. These emissions may result in a localised reduction in air quality in the area. The exhaust emissions are expected to disperse rapidly in the offshore location and will be temporary and small in volume. Therefore, significant impacts to air quality are not considered likely given the distance from populated areas and other sensitive onshore receptors. The MODU and vessels will be in compliance with MARPOL 73/78 (Annex VI) (as applicable or required by vessel class, and no significant impacts on ambient air quality are anticipated.
Impact from lighting on MODU on marine fish, turtles and seabirds	Lighting is a health and safety requirement for safe operation of the MODU. Lighting from MODU and other vessels can cause behavioural responses in which animals (turtles, seabirds, fish and dolphins) can alter their foraging and breeding activity. In addition, it is possible that seabirds may fly over the Project Area. However, as the Project Area is 21 miles (35 km) from the nearest coastline and lighting will only impact a small area; there is unlikely to be a significant impact on marine fauna and seabirds. The drilling activity will also by temporary; reducing the potential for impact.
Impacts from routine MODU and vessel discharges on marine environment	The MODU and support vessels will routinely discharge sewage, grey water, putrescible (food) waste, bilge water and deck drainage. Sensitive marine habitats are generally found in shallow waters, typically less than 66 ft (20 m) water depth. Given the water depth within the Project Area ranges up to and over ~7870 ft (2400 m), there is no potential for vessel discharges to impact shallow water habitats. These discharges are typical for marine vessels and are managed in accordance with MARPOL 73/78 (as applicable or required by vessel class). Routine discharges such as sewage, grey water etc. will have localised and temporary impacts to water quality of surface waters in close proximity to the discharge source. In the open offshore environment rapid dilution and dispersion will dissipate any adverse effects to marine biota from potential eutrophication of the surrounding waters with the exception of a small area in close proximity to the discharge point. However, given the short duration of the drilling program (about 60 days per well) and the rapid dilution and dispersion of routine discharges in the open ocean environment, no long term impacts are expected. As such, no significant impacts are expected to occur.
Impacts from underwater sound generated by drilling, the MODU and support vessels, and helicopters	Underwater sound will be generated by drilling, the MODU and support vessels, and helicopters. Drilling noise is generally low level, low frequency and continuous with most energy concentrated below one kilo hertz (kHz). Reported continuous sound produced by drilling activities may produce received sound levels of 110 to 130 decibels (dB) re 1 micropascal (µPa) @ 3.3 ft (1 m). Supply vessels peak frequency or band ranges from 1–500 hertz (Hz) at a peak source level of 170–190 dB re 1 µPa @ 3.3 ft (1 m). Routine operations from drilling and vessel movements do not have the intensity and characteristics likely to cause physiological damage to marine fauna. Helicopter movements for the purpose of crew changes are expected to be infrequent. Helicopter noise will be temporary and short term. Low frequency noise produced by helicopters do not transmit effectively from air to water [56] and sound characteristics are not expected to result in physiological impacts to marine fauna.
Standard waste generation and disposal to sea	There will be no planned discharge of solid wastes to the marine environment. All solid wastes will be collected and disposed of at an appropriate onshore facility. Solid waste does not include food waste. Therefore, there is no impact from solid waste disposal to sea from this Project.

(56) Richardson, W.J., Greene, Jr., C.R., Malme, C.I. and Thomson, D.H. 1995. *Marine Mammals and Noise.* Academic Press.

Impact	Rationale for scoping out of assessment
Unplanned events	
Impacts from accidental loss of solid hazardous or non-hazardous wastes to the marine environment (excludes sewage, grey water, putrescible waste and bilge water).	The MODU and support vessels will generate a variety of solid wastes including packaging and domestic wastes. Accidental discharge or loss of material overboard may result in impacts on marine fauna. Impacts to marine fauna include pollution and contamination of the marine environment, and secondary toxicity and physical effects on marine fauna through ingestion or entanglement. Given the offshore location of the Project Area and distance from sensitive receptors, and the short duration of the drilling program (about 60 days per well) any potential impact would be highly localised. To reduce impacts, all solid wastes will be managed under a waste management plan (or equivalent) specifying the segregation (as required) and appropriate storage, transfer and transport of wastes in order to reduce the risk of accidental loss of wastes to the marine environment. All non-hazardous and hazardous solid wastes generated offshore are to be disposed of by a licenced waste management contractor and therefore no significant impacts are expected to occur.
Introduction of invasive marine species associated with ballast water transfer and transportation of invasive marine species via MODU/ vessel hulls, internal niches or in-water equipment.	Invasive marine species (IMS) present within the water column may be collected with the intake of seawater and survive within ballast tanks. Marine species may then be relocated and discharged with the ballast water in the Project Area. There is also potential for the introduction and establishment of IMS from biofouling present on the hull of the MODU and support vessels. This can lead to the introduction of IMS which can become invasive if the environmental conditions at the point of release are suitable. Given the distance from nearshore waters (about 21 miles (35 km) from the mainland) and the water depth at the proposed drilling location (> 6560 ft (2000 m)), the potential for the introduction of IMS is low and no significant impacts are expected. During the drilling program, the MODU will remain offshore and there is no plan to enter nearshore waters in Myanmar therefore reducing the potential to introduce IMS into sensitive areas where the proliferation of non-native species may occur. In addition, vessels will have valid anti-fouling coating certificates. The Woodside Invasive Marine Species Management Plan (IMSMP) will be applied to the MODU and all vessels to minimise the risk of introducing invasive marine species during marine activities. On this basis, no significant impacts are expected to occur.
Impacts from dropped objects on marine habitats	During the drilling program, there is the potential for objects to be dropped from the MODU and/or support vessels overboard into the marine environment resulting in the localised disturbance of benthic habitats. Dropped objects refer to larger drill equipment such as drill pipes and do not include smaller objects such as personal protective equipment (PPE). Marine benthic habitats within the Project Area are considered to be of low sensitivity consisting of unconsolidated soft sediments, typically supporting low levels of biota and representative biodiversity. Operations will be undertaken in accordance with approved plans and procedures to prevent dropped objects. Additionally, dropped materials and equipment will be recovered where safe and practicable to do so. Given the adopted controls in place, any dropped objects are expected to result in a temporary disruption to a small area of the seabed, limited to a small proportion of the benthic population and with no impact on sensitive habitats. No significant impacts are expected to occur.
Impacts from unplanned venting of gas during drilling (well kick)	During drilling of the well, a kick can occur if encountering unexpected reservoir pressure. A kick is an undesirable influx of formation fluid into the wellbore. The formation fluid can be water or hydrocarbon or a combination of the two. To manage a kick, the volume of fluid is circulated to surface in a controlled manner and any gas is processed and released to the atmosphere via a separator and a vent line. The volume of any gas is small and may result in a temporary decrease in local air quality. Woodside will verify that relevant contractor procedures align with Woodside requirements for well control. Given the minor volumes and the offshore location no significant impacts on ambient air quality are expected.
Loss of well control/integrity (well blow out)	Woodside Energy Ltd. is an experienced operator with a history of effectively implementing industry standard practice in well design and construction. In the company's 60 year history, it has not experienced any well integrity events that have resulted in significant releases nor significant environmental impacts. Analysis of the A-6 deep water prospects has indicated that the target hydrocarbons are expected to be dry gas. The gas encountered at Shwe Yee Htun-1 was dry gas. In the event of a well blowout, no associated liquids would be released to the marine environment.

Impact	Rationale for scoping out of assessment
Marine fauna collision	A MODU and associated support vessels will be present in the Project Area during the drilling program. The potential for the vessels to collide with marine fauna (especially marine mammals) is unlikely given the small number of vessel movements during the drilling program and the location of the Project Area (distant from known marine fauna aggregation areas). Additionally, during operations, vessels will implement a number of controls to reduce the potential for interactions between vessels and marine fauna.
H_2S emissions	Fluid samples of the reservoir fluid from the Shwe Yee Htun-1 well indicate the H_2S concentration is <3ppm. As such, the risk of H_2S is deemed to be low. Waste, including chemicals, will be managed in accordance with international standards (e.g. MARPOL) and Myanmar national standards. There is a low potential for any H_2S emissions from chemicals and no risk of exposure of the workforce on the MODU; as such, this has been scoped out of the EIA Study.
Coastal impacts	The coastal habitats within the Ayeyarwady Region and southern Rakhine State include seagrass, coral reefs, mangroves and their associated species. These are thought to be also present around the vicinity of Ngwe Saung beach which is located over 21 miles (35 km) from the Project Area. From a socio-economic point of view, there are a number of tourist attractions adjacent to the Project Area, including Ngwe Saung and Chaungthar beaches. The impacts of the Project will be localised to the Project Area. The Project Area is a minimum of 21 miles (35 km) from the coast; therefore, drilling activities will have no physical interaction with the coastline and are unlikely to be visible from the shore. The only associated activity that crosses the coastline is the transit of helicopters to support crew changes. On average there will be approximately one to two (up to a maximum of three) round trips per day during drilling operations which will fly over the coastline at a minimum height of approximately 4000 ft. Given the offshore location of the Project Area and the potential spatial extent of the impacts, it is unlikely that local communities from the adjacent coastline will be impacted.

6.4 DETERMINATION OF IMPACT SIGNIFICANCE, MITIGATION MEASURES AND RESIDUAL IMPACT SIGNIFICANCE

6.4.1 Impacts from Greenhouse Gas Emissions from the MODU, Support Vessels, Machinery Engines and Flaring

Source of Impact

Air emissions during the proposed drilling program may arise from combustion sources such as engines and machinery on the MODU and support vessels and from intermittent flaring activities during the testing of some of the proposed wells. Air emissions will be localised and will rapidly disperse in the open offshore environment. The potential for exposure and interaction with communities is highly limited due to the distance from the coastline. Direct impacts to the marine environment or communities are not expected. However, combustion emissions from these sources will include GHGs, primarily CO_2, and lesser amounts of CH_4 as well as indirect GHGs such as N_2O and SO_2.

As outlined in *Section 4.4.1* and *Section 4.4.2* the emission of GHG is unavoidable during the operation of the MODU and vessels, and flaring activities will be limited to a small number of wells and for a short period of time for each well. The total tonnage of CO_2 equivalent (tCO_2e) predicted to be produced by the MODU is about 23,853 tCO_2e. This is primarily emitted by fuel use by internal combustion engines, while flaring is expected to contribute a negligible amount (about 30.62 tCO_2e).

Existing/ In Place Controls

The following controls will be implemented:

- The well test duration will be minimised to the extent possible.
- Energy efficient design and operation of machinery.
- Engine maintenance to minimise unburned hydrocarbons.

- The MODU and support vessels will have International Air Pollution Prevention (IAPP) certificates, in accordance with the requirements of Annex VI MARPOL 73/78 (as applicable or required by vessel class). Certification under MARPOL will confirm that engines and other combustion emission sources on the vessels (excluding emission sources directly associated with the extraction of hydrocarbons, such as flaring) meet IMO standards.
- Vessels (as applicable or required by vessel class) will have a Ship Energy Efficiency Management Plan (SEEMP) providing for fuel efficient vessel operations, in accordance with the requirements of Annex VI MARPOL 73/78 (as applicable or required by vessel class).
- Low sulphur diesel (3.5% sulphur by mass) will be used where available.

Significance of Impact

World Resources Institute data [57] indicates that Myanmar's total GHG emissions in 2012 were 98.93 $MtCO_2e$ (total million tonnage of CO_2 equivalent) (excluding land use change and forestry; 184.71 $MtCO_2e$ including land use change and forestry). Myanmar is currently considered a net GHG sink owing to the country's expanse of forests; however, deforestation and agriculture is currently Myanmar's largest contributor to net GHG. Proposed mitigation and adaptation measures include actions to increase forest management and develop a more diverse and efficient energy supply mix. Natural gas is included in Myanmar's energy strategy and a shift from coal to a greater proportion of natural gas for electricity production has also been recognised as an option that could result in significant CO_2 emission reductions in Myanmar [58].

At a global level, GHG emissions contribute to anthropogenic climate change with subsequent effects on weather events, ecosystems, biodiversity and the livelihoods of people. Myanmar has been ranked globally as one of the most vulnerable countries in the world to extreme weather events, and may be further exposed to the negative impacts of climate change in the future [59].

The magnitude of potential impacts of GHG emissions from the Project however, is considered negligible as the 23,853 tCO_2e estimated emissions contribution is equivalent to less than 0.0002% of Myanmar's total national annual GHG emissions (based on the 2012 data). The amount of CO_2e is also insignificant in the context of major GHG emitting industries and activities referenced by the IFC ([60]). No discernible change is therefore expected as a result of the Project emissions. Therefore, impacts are considered **Negligible** (*Table 6.16*).

(57) CAIT Climate Data Explorer. 2015. Washington, DC: World Resources Institute. Available online at: **http://cait.wri.org**

(58) UNEP RISØ (2013). Emissions Reduction Profile: Myanmar. June 2013. Supported by ACP-MEA and UNFCCC. Available online at: http://www.unepdtu.org/-/media/Sites/Uneprisoe/Publications%20(Pdfs)/Emissions%20Reduction%20Potential/FINAL%20Country%20Profile%20Myanmar.ashx?la=da

(59) The Republic of the Union of Myanmar (2015). Myanmar's Intended Nationally Determined Contribution – INDC. 25-8-2015. Available online at: **http://www4.unfccc.int/submissions/INDC/Published%20Documents/Myanmar/1/Myanmar's%20INDC.pdf**

(60) World Bank Group (2007). International Finance Corporation General Environmental Health and Safety Guidelines. April 30 2007. Available online at: **http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines**

Table 6.16 Assessment of Impacts from GHG Emissions

Impact	Air emissions from the project contributing to national and global GHG emissions and the effects of climate change.				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	GHG emission contributions from the project will be negligible (less than 0.0002% of Myanmar's national annual GHG emissions)				
Frequency	GHG emissions will occur for about 60 days at each well location over the total duration of the project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

Additional Mitigation, Management and Monitoring

As the impact is of negligible magnitude, the control measures adopted by the Project are considered sufficient for reducing the impact of GHG emissions on the environment. As such, no further mitigation measures are required.

Significance of Residual Impacts

The residual impacts from GHG emission are considered likely to be of **Negligible** significance.

6.4.2 Impacts from Drill Cuttings and Drilling Fluid Discharges to Sediment Quality, Benthic Communities, Water Quality, Fish and Pelagic Communities

Source of Impact

For each well, it is anticipated that about 561 m^3 of cuttings using WBDF and seawater sweeps will be discharged directly to the seabed from the riser-less drilling of the two top-hole sections. Once the BOP and riser are in place, the bottom-hole sections will be drilled using NADF in a closed circulation system enabling the re-use of drilling fluids. It is anticipated about 97 m^3 of cuttings (per well) using NADF will be discharged to the marine environment below the water line after treatment with the MODU's SCE (refer *Section 4.3.3*).

Drilling Fluid Characteristics

WBDF consists of about 92–98% fresh or saline water, with the remaining 2–8% comprising of drilling fluid additives that are generally inert or readily biodegradable organic polymers [61] [62], with priority given to using additives rated as PLONOR (Pose Little or No Risk), Group E and F or Gold rating [63] as per the Woodside Chemical Assessment Process; an internal process for assessing the use of chemicals during drilling.

(61) APPEA (1998) Framework for the environmental management of offshore discharge of drilling fluids on cuttings, Australian Petroleum Production and Exploration Association, Issue Paper, 29 pp.

(62) GESAMP (1993) Impact of Oil and Related Chemicals and Wastes on the Marine Environment. GESAMPS Reports and Studies No. 50. Joint Group of Experts on the Scientific Aspects of Marine Pollution.

(63) OSPAR (2004) OSPAR List of Substances / Preparations Used and Discharged Offshore which are considered to Pose Little or No Risk to the Environment (PLONOR), OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic

A synthetic organic base fluid (40 to 65% by volume) is used in NADF. NADF are designed to be low toxicity with faster biodegradability than traditionally-used fluids [64]. Priority will be given to use of NADF that are non-bioavailable, based on their physical/chemical properties. The use of NADF is subject to internal justification including environmental consideration with reference to OCNS rating of additives as per the Woodside Chemical Assessment Process.

Drill Cuttings Characteristics

Drill cuttings are generated by the rock fragments brought up from the well as the drilling takes place through the subsea geological formations. Cuttings are determined by the subsea formation type or lithology, the drill bit type and total depth of the well.

Where NADF are used, drill cuttings may clump together to make larger particle sizes [65]. The SCE on-board the MODU separates the drill cuttings and NADF recovered from the well bore in a closed system. The process, using the SCE, limits the average oil on cuttings [66] for the wells to 6.9% or less by weight before the cuttings with NADF are discharged overboard.

Impacts to Sediment Quality

The discharge of the anticipated 561 m^3 of cuttings at the seabed is expected to result in the formation of a cuttings pile immediately around the well site [67]. The characteristics and size of the pile will depend on a number of factors including particle size of the cuttings, tidal and current forces and water depth [68]. In contrast, for bottom hole sections using NADF, where cuttings are discharged in surface waters far above the seabed, cuttings will contribute little to the cuttings pile due to dispersion by currents in the water column as they settle [69] [70]. Coarse sediment particles that clump together may settle to the seabed, while finer particles form a plume in the water column that dilutes rapidly as it drifts away from the discharge point. Dissolved components of the plume dilute rapidly by mixing in the water column [71]. The finer particles of the NADF cuttings may eventually settle forming thin veneer patches of fine particles on the seabed [72] [73]. Of the fraction that settles, settling may typically occur over distances in the order of 656 ft (200 m) to 3,281 ft (1,000 m) radius from the discharge point, possibly further depending on the water depth, current speed and movement, with concentrations decreasing over distance.

Drill cuttings discharge may potentially result in minor localised increase in concentrations of organic compounds and metals near the well such as aluminum from aluminum phyllosilicate clay (bentonite). Upon cessation of drilling, concentrations of most contaminants would be expected to gradually return to within the range of background conditions, through mechanisms including dissolution, biodegradation and resuspension and transport by bottom currents. An exception is likely to be barium from barium sulphate (barite) present in drilling fluids, which is insoluble and relatively persistent in the marine environment. Concentrations of barite (a non-toxic PLONOR

(64) Neff, J. M. (2005, January). Composition, environmental fates, and biological effect of water based drilling muds and cuttings discharged to the marine environment: A synthesis and annotated bibliography. In Report prepared for the Petroleum Environmental Research Forum (PERF). Washington DC: American Petroleum Institute. Available from http://www.perf.org/images/Archive_Drilling_Mud.pdf.

(65) Neff JM, McKelvie S and Ayers Jr RC (2000). Environmental impacts of synthetic based drilling fluids. Final report for US Department of Interior Minerals Management Service. OCS Report MMS 2000-064 pp119.

(66) The film of drill fluid on the cuttings is called oil on cuttings.

(67) Neff, J. M. (2005, January). Op. cit.

(68) Hinwood. JB, Poots AE, Dennis LR, Carey JM, Hourdis H, Bell R, Thompson JR, Boudreau P and Aylin AM (1994). Op.cit

(69) Hinwood. JB, Poots AE, Dennis LR, Carey JM, Hourdis H, Bell R, Thompson JR, Boudreau P and Aylin AM (1994). The environmental implication of drilling activities, in Swan JM, Neff JM and Young PC (eds) Environmental Implications of Offshore Oil and Gas Development in Australia – The findings of an Independent Scientific Review. Australian Petroleum Exploration Association, Sydney, Australia, pp. 123-207

(70) Neff JM, McKelvie S and Ayers Jr RC (2000) Environmental impacts of synthetic based drilling fluids. Final report for US Department of Interior Minerals Management Service. OCS Report MMS 2000-064 pp119.

(71) IOGP (2016). Environmental fates and effects of ocean discharge of drill cuttings and associated drilling fluids from offshore oil and gas operations. pp144. Report 543.

(72) Hinwood. JB, Poots AE, Dennis LR, Carey JM, Hourdis H, Bell R, Thompson JR, Boudreau P and Aylin AM (1994). Op. cit.

(73) IOGP (2016). Op. cit.

substance) will, however, be sufficiently low and not in a readily bioavailable form, so as to not pose an environmental concern.

Potential oxygen reduction can occur in the sediment of cuttings piles particularly where NADF is used due to microbial biodegradation of the adhered synthetic base organic fluid. Given most of the cutting pile will be derived from the top-hole sections where seawater sweeps and WBDF is used, the potential for oxygen reduction effects in sediment will be limited and no lasting adverse impacts are expected.

Impacts to Benthic Communities

The wells will most likely take place in a water depth of about 7870 ft (2400 m). The deep sea benthic communities expected to inhabit soft sediment habitats in these aphotic areas (where there is limited or no light penetration and temperatures are low) are expected to comprise a low density of common organisms such as polychaetes, foraminifera, hydrozoa, sponges, crustaceans, molluscs and echinoderms (refer *Section 5.4.2*) which are likely well-represented in the region and therefore considered a low sensitivity receptor.

Potential impacts to benthic communities from the discharge of drill cuttings and fluids include:

- Sediment depositional impacts to benthic communities and potential alteration of the sediment particle size characteristics of the seabed;
- Toxicity and bioaccumulation effects; and,
- Deoxygenation effects to infauna due to microbial process on organically enriched sediments.

Sessile benthic marine organisms may become buried or their feeding and respiratory systems could become clogged. Such effects would be confined to the immediate surrounds of each well where sediment deposition from top-hole cutting deposition may exceed one kg/m^2 and thus would be limited to a local scale. The anticipated volume of bottom-hole cuttings for each well is small (97 m^3) and, given the dispersive open water well locations, which will most likely take place in a water depth of about 7870 ft (2400 m), the NADF cuttings that will be discharged near the sea surface are expected to disperse over a broad area. This will result in low sedimentation rates in the wider area and likely represent a negligible change compared to natural sedimentation rates. The deposition will be localised to the well site and will occur in scattered and isolated as thin veneer patches of fine-sized particles.

Given Group III synthetic organic base fluid will be selected for the Project, which is the least toxic compared to Groups I and II, the potential for toxicity effects to benthic communities will be very minor. Group III synthetic organic base fluid are either sufficiently water soluble such that they typically do not bio-accumulate in the lipids of marine organisms or are insoluble making them not biologically available [(74)]. Most of the organic compounds in NADF are biodegradable and are broken down over time by microbes. In addition, metals present in drill cuttings and fluids are strongly bound to particles that make them insoluble and hence they are not biologically available even when digested by a marine organism [(75)]. As NADF cuttings and adhered synthetic organic base fluid will be dispersed on their long descent to the seabed, any potential for toxicity effects to occur to benthic organisms is substantially reduced. The area in the immediate vicinity of wellhead where the cutting pile has formed will comprise cuttings overwhelmingly derived from cuttings from the top-hole sections where seawater sweeps and WBDF (rated as non-toxic to slightly toxic) is used. Any potential for toxicity and bioaccumulation effect are expected to be very minor and short-lived and is not expected to impede recolonization processes at the cuttings pile or any affected immediate surrounds.

(74) IOGP (2016) Environmental fates and effects of ocean discharge of drill cuttings and associated drilling fluids from offshore oil and gas operations. pp144. Report 543.

(75) USEPA (2000) Development Document for Final Effluent Limitations Guidelines for Synthetic Based Fluids and other Non-Aqueous Drilling Fluids in the Oil and Gas Extraction Point Source Category, EPA-821-B-00-013.

Reduction in oxygen levels in sediment have the potential to cause secondary impacts to benthic infaunal communities if oxygen concentrations decline to levels where anoxic or hypoxic conditions form. This effect is typically associated with decay of the organic content of NADF and can be the main factor in determining potential impacts to infauna. Species sensitive to anoxic environments are typically eliminated and replaced by tolerant and opportunistic species, so species diversity decreases, but the number of individuals often increases [(76)]. Given that the cuttings pile is likely to be formed primarily from seawater sweeps and WBDF from the top-hole sections, the potential for oxygen reduction effects in sediment is assessed to be small and short-term such that indirect impacts to infauna will be negligible and these species are considered to be of low sensitivity to Project activities. The thin veneer of fine-sized particles from deposition of NADF drill cutting particles is expected to be rapidly reworked in the surficial sediment by natural processes such as bioturbation [(77)].

Overall, any effects to benthic species or habitats will be highly localised to around the well head and recovery by recruitment of new colonising organisms and migration from adjacent undisturbed seabed area is expected to commence shortly after drilling finishes [(78)(79)]. Recolonization is typically well advanced within a year, though processes are likely to take longer in deepwater environments. In a study on the impacts to the benthic environment resulting from the discharge of drill cuttings and NADF in deep water, it was concluded that environmental impacts were minimal and highly localised to well sites [(80)].

Impacts to Water Quality

The main source of impact to water quality will be the operational discharge of cuttings and NADF in the upper water column after treatment by the SCE. Fine particles (fine silt and clay) will tend to remain in suspension to form a turbid plume being dispersed and diluted to lower concentrations down current of the discharge pipe. Plume dilutions by a factor of 10,000 within a downstream current distance of 328 ft (100 m) have been reported [(81)], with dilution to ambient concentrations (based on suspended solid concentrations and light transmittance) within 1,148–4,921 ft (350 - 1500 m) downstream from the discharge location [(82)]. Given the relatively short duration of the proposed drilling activities at each well site (about 60 days), impacts to water quality are expected to be localised and temporary in nature. The plume is expected to dissipate rapidly given the plume will move with the current.

Impacts to Fish and Pelagic Communities

Marine water column organisms are at a low risk of harm from drill cuttings discharge due to the rapid dilution and dispersal downstream of the well site by prevailing currents. Mobile organisms, such as fish and larger crustaceans usually avoid or move away from plumes of suspended drill cuttings, which reduces the potential for exposure and impact[(83)]. Many fish are able to tolerate elevated Total Suspended Solids concentrations simply by flushing their gills. The potential for toxicity effect to fish and pelagic organisms due to impacts to water quality will be limited due to the use of WBDF and NADF with a rating of non-toxic, slightly toxic or low toxicity, as per the Woodside Chemical Assessment Process. Average oil on cuttings for the wells will be limited to

(76) Neff, J. M. et al. (2000). Environmental impacts of synthetic based drilling fluids. Final report for US Department of Interior Minerals Management Service. OCS Report MMS 2000-064 pp119.

(77) USEPA (2000) Op.cit.

(78) Neff, J. M. (2005, January). Composition, environmental fates, and biological effect of water based drilling muds and cuttings discharged to the marine environment: A synthesis and annotated bibliography. In Report prepared for the Petroleum Environmental Research Forum (PERF). Washington DC: American Petroleum Institute. Available from **http://www.perf.org/images/Archive_Drilling_Mud.pdf**.

(79) IOGP (2016) Op. cit.

(80) Balcom BJ, Graham BD, Hart AD, Bestall GP (2012) Benthic impacts resulting from the discharge of drill cuttings and adhering Synthetic Based Drilling Fluids in Deepwater. Conference Paper. International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production, 11-13 September, Perth, Australia

(81) Hinwood. JB, Poots AE, Dennis LR, Carey JM, Hourdis H, Bell R, Thompson JR, Boudreau P and Aylin AM (1994). Op.cit.

(82) United Nations Environment Programme (UNEP) (1985) Marine Pollution Studies Series.

(83) IOGP (2016). Environmental fates and effects of ocean discharge of drill cuttings and associated drilling fluids from offshore oil and gas operations. pp144. Report 543.

6.9% or less by weight for cuttings with NADF through the use of the SCE prior to discharge. On discharge of the NADF in the upper water column, rapid dilution and dispersion will occur and aid in the reduction of the concentration of NADF fluid to below levels that could elicit a toxic response. Given that fish and pelagic organisms are mobile and would have a temporary, transient exposure to the plume, the potential for toxicity effects to occur is considered negligible.

Existing/ In Place Controls

The following controls will be implemented:

- WBDF shall be used as the first preference and where WBDF cannot meet required specifications, NADF may be used following technical justification.
- All residual NADF will be returned to shore for reconditioning, re-use or disposal.
- The average oil content for discharge of NADF pit cleaning slops will be limited to less than 1% by volume.
- Average oil on cuttings for the wells will be limited to 6.9% or less by weight
- No bulk discharge of NADF drilling fluids will be permitted offshore.
- Where cuttings are discharged overboard, they will be discharged below the water line.
- NADF system set up via the Woodside NADF Start-up Checklist.
- All chemicals that may be discharged to the marine environment during the proposed drilling program will be selected and approved as per the Woodside Chemical Assessment Process.
- All Woodside approved chemicals are included on the Chemical Selection List which is regularly reviewed.
- Bulk operational discharges conducted under the MODU's permit to work (PTW) system (to operate discharge valves/pumps).

Significance of Residual Impact

With the implementation of the existing / in place controls, and given the short duration of the drilling activity at each well (about 60 days), the temporary or short-term duration of impacts and localised scale of impacts to medium to low sensitivity receptors, the significance of impacts due to operational discharges of drill cuttings and drilling fluids is considered be **Minor** to **Negligible** for sediment quality, benthic communities, water quality, fish and pelagic communities (Table 6.17 to *Table 6.20*).

Table 6.17 Assessment of Impacts from Operational Discharge of Drill Cuttings and Drilling Fluids on Sediment Quality

Impact	Deposition of cuttings on seabed sediments and change in sediment quality				
Impact Type	**Direct**	Indirect	Induced		
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
Impact Extent	**Local**	Regional	International		
Impact Scale	Drill cutting pile formation around each well site and minor increase in sedimentation rate in wider area				
Frequency	Operational discharges and formation of the cuttings pile will occur over the duration of drilling activity (about 60 days) at each of the well sites.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
Resource Sensitivity	**Low**	Medium	High		
Impact Significance	**Negligible**	Minor	Moderate	Major	

Table 6.18 Assessment of Impacts from Operational Discharge of Drill Cuttings and Drilling Fluids on Benthic Communities

Impact	Sediment deposition on benthic communities			
Impact Type	**Direct**	Indirect	Induced	
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
Impact Extent	**Local**	Regional	International	
Impact Scale	Impacts to benthic community under the cutting pile limited to the immediate surrounds of each well site			
Frequency	Operational discharges and formation of the cuttings pile will occur over the duration of drilling activity (about 60 days) at each of the well sites.			
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
Resource Sensitivity	**Low**	Medium	High	
Impact Significance	**Negligible**	Minor	Moderate	Major

Table 6.19 Assessment of Impacts from Operational Discharge of Drill Cuttings and Drilling Fluids on Water Quality

Impact	Impacts to water quality			
Impact Type	**Direct**	Indirect	Induced	
Impact Duration	**Temporary**	Short-term	Long-term	Permanent
Impact Extent	**Local**	Regional	International	
Impact Scale	Localised and temporary impacts to water quality are expected within the plume (e.g. within approximately a kilometer of each well site according to referenced examples).			
Frequency	Operational discharges and dispersion of drill cuttings will occur over the duration of drilling activity (about 60 days per well).			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
Resource Sensitivity	**Low**	Medium	High	
Impact Significance	Negligible	**Minor**	Moderate	Major

Table 6.20 Assessment of Impacts from Operational Discharge of Drill Cuttings and Drilling Fluids on Fish and Pelagic Communities

Impact	Exposure of fish and pelagic communities to turbid plume			
Impact Type	**Direct**	Indirect	Induced	
Impact Duration	**Temporary**	Short-term	Long-term	Permanent
Impact Extent	**Local**	Regional	International	
Impact Scale	Localised potential for change in behaviour (avoidance).			
Frequency	Operational discharges and formation of the cuttings pile will occur over the duration of drilling activity (about 60 days) at each of the well sites.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
Resource Sensitivity	**Low**	Medium	High	
Impact Significance	Negligible	**Minor**	Moderate	Major

Additional Mitigation, Management and Monitoring

Given the Minor to Negligible impact significance, no additional mitigation is considered necessary provided the existing controls are appropriately implemented.

Significance of Residual Impacts

The residual impacts from operational discharges are considered likely to be **Negligible** to **Minor** significance for sediment, benthic communities, water quality and fish and pelagic communities.

6.4.3 Impacts from Underwater Sound Generation on Marine Fauna

Source of Impact

The use of VSP has the potential to generate elevated underwater sound in the vicinity of the well. VSP uses a small airgun array, typically comprising either a system of three 250 cubic inches (inch^3) airguns with a total volume of 750 inch^3 of compressed nitrogen at about 2000 pounds per square inch (psi). During VSP operations, four to five receivers are positioned in a section of the wellbore and the airgun array is discharged about five times at 20 second intervals. The generated sound pulses are reflected through the seabed and are recorded by the receivers to generate a profile along a section of the wellbore. This process is repeated as required for different stations in the wellbore and each wellbore may require about ten hours of VSP operation within a 24 hour period per well.

Acoustic modelling undertaken for VSP for similar drilling activities indicates that sound pressure levels generated at source (3.3 ft (1 m)) are equivalent to about 216 dB re 1 µPa [(84)]. Applying a spherical loss propagation approach to sound propagation (sound propagates uniformly in all directions in deep water), sound levels are predicted to attenuate to about 160 dB re 1µPa within about 2000 ft (600 m) of the source. In the shallower areas of the Project Area, sound propagation may not be entirely spherical due to reflections and interactions with the seabed and, therefore sound propagation may extend further in some directions, however, sound levels will still fall to low levels within a relatively short distance from the source.

Existing/ In Place Controls

Measures to control/ minimise adverse impacts from an increase in underwater sound levels associated with VSP operations will include the adoption of Woodside's internal procedures for VSP for marine fauna, including:

- A visual check for marine fauna within 0.6 miles (1 km) (observation zone) of the MODU or vessel for 20 minutes prior to commencing VSP operations.
- Soft start - build up power for VSP slowly to give adequate time for marine fauna to leave the area (20 minutes at minimum). If a whale or marine turtle is sighted within the shut-down zone 1640 ft (500 m), the acoustic source should be shut down completely.
- Soft start procedures should only resume after the whale(s) or turtle(s) has been observed to move outside the shutdown zone (500 m) or when 30 minutes have lapsed since the last sighting.
- Visual observations of the observation zone (1 km) must be maintained continuously to identify if there are any whales or turtles present.
- During periods of low visibility (where the observation zone cannot be clearly viewed out to 1 km), including night-time, the VSP source may be used as described in soft start procedures and operating procedures, provided that:
    - There have not been three or more whale shut down situations during the preceding 24 hour period; or

(84) Chevron 2008. Referral of Wheatstone Iago Drilling Programme – Appendix 2: VSP airgun source modelling and pressure level modelling March 2008. Available at: http://www.environment.gov.au/cgibin/epbc/epbc_ap.pl?name=current_referral_detail&proposal_id=4134

- If operations were not previously underway during the preceding 24 hours, a period of continual observation was undertaken in good visibility for at least two hours (to the extent of the observation zone) within the preceding 24 hour period and no whales were sighted.

- A trained crew member will be utilised during VSP operations to monitor and record marine mammal and turtle observations.
- Pre start meeting with crew to include marine fauna observation and reporting.
- During the pre-start meeting, alert all crews to immediately report to the trained observer when they observe any marine fauna during and prior to the activity. The pre-start meeting will cover the likelihood of whale observations and required actions if they are sighted.

Significance of Residual Impact

Depending on received sound levels and the sensitivity of the specific marine fauna, exposure to underwater sound has the potential to affect receptors in four main ways:

- Physical injury. Direct physical injury of the fauna due to rupture or damage of body tissue, which may lead to mortality in extreme cases.
- Auditory injury and auditory fatigue. Permanent change to hearing (known as a Permanent Threshold Shift (PTS)) and temporary auditory fatigue (known as Temporary Threshold Shift (TTS))
- Behavioural changes. Behavioural changes include temporary cessation of activity (e.g. foraging), and changes in swimming behaviour or direction of fauna.
- Masking or interfering with other biologically important sounds. This includes vocal communication, echolocation signals and sounds produced by predators or prey.

The sensitivity of different key sensitive receptors within the waters of the Ayeyarwady Region in relation to the predicted sound levels are discussed below.

Marine Mammals

Marine mammals are considered the receptor most susceptible to impacts from anthropogenic underwater sound sources. Whales and dolphins in particular utilise sound for communication, socialising, breeding and (for dolphins) foraging and feeding.

Low frequency mammals (e.g. large baleen whales such as humpback, blue and Bryde's whales) are considered to be most sensitive to the frequency levels generated by VSP (<500 Hz) [(85)]. These species are known to be present in the waters off the Ayeyarwady Region. Mid and high frequency mammals (toothed whales such as dolphins and sperm whales) are considered to be most sensitive to sound greater than 1 kHz and are therefore less sensitive to the low frequency sound from VSP. These species are also known to be present in Myanmar waters. Peak sound pressure levels of 230 dB re 1 µPa and 224 dB re 1 µPa for a single pulse are widely accepted as impact criteria for PTS and TTS in cetaceans respectively [(1)]. US National Marine Fisheries Service and National Oceanographic and Atmospheric Administration agencies have also provided an SPL threshold of 160 dB re 1µPa (rms) whereby behavioural avoidance may occur [(86)].

Little information is available on sensitivity of dugongs to sound; however, similar to dolphins, they are understood to be most sensitive to sound frequencies greater than 1 kHz [(87)], and therefore are not anticipated to be affected significantly by low frequency sounds generated by the VSP source. Further, given the deep water offshore location of the Project Area in relation to suitable dugong

(85) Southall, BL, Bowles, AE, Ellison, WT, Finneran, JJ, Gentry, RL, Greene Jr., CR, Kastak, D, Ketten, DR, Miller, JH, Nachtigall, PE, Richardson, WJ, Thomas, JA and Tyack, PL. 2007. Marine mammal sound exposure criteria: Initial scientific recommendations. Aquatic Mammals, vol. 33, iss. 4, pp. 411-509.

(86) National Marine Fisheries Service (US) and [NOAA] National Oceanic and Atmospheric Administration. 1995. Small takes of marine mammals incidental to specified activities; offshore seismic activities in southern California: Notice of issuance of an incidental harassment authorization. Federal Register 60(200): 53753-53760.

(87) Anderson, PK and Barclay, RMR. 1995. Acoustic Signals of Solitary Dugongs: Physical Characteristics and Behavioral Correlates. Journal of Mammalogy, Vol. 76, No. 4, pp. 1226-1237.

habitat (nearshore/coastal areas), exposure of dugongs to sounds generated by the VSP source is not expected.

Marine turtles

Turtles are generally considered to be less sensitive to sound than marine mammals. Only a few studies have looked into hearing capabilities of marine turtles which have shown that turtles respond to low frequency sound, with highest hearing sensitivity in the frequency range 100–700 Hz [88], which mostly coincides with the frequency range of sound emitted from seismic sources used for VSP (<500 Hz). Information on the sound level thresholds at which impacts to turtles may occur is limited, although peak sound pressure levels greater than 207 dB re 1µPa from a single seismic pulse have the potential to result in injury [89]. Sound pressure levels ranging between 166 and 175 dB re 1µPa (rms) may result in behavioural responses (e.g. avoidance) [90][91].

Fish

Fish hearing abilities vary widely even within families, but fish are generally most sensitive to frequencies below 1 kHz [92]. Hearing sensitivity in bony fish is a function of the inner ear, specialised auditory structures and, if present, the swim bladder, which provides an indirect route for sound to reach the inner ear [93]. Some fish have a special connection between the swim bladder and the inner ear, providing an enhanced indirect route. These fish are considered to be 'hearing specialists' and are more sensitive to sound compared to non-specialised fish (hearing generalists). Peak sound pressure levels greater than 213 dB re 1µPa from a single seismic pulse have the potential to result in injury to hearing specialist fish [94]. Single pulse sound pressure levels resulting in impacts such as TTS are not well understood, although TTS has been observed in hearing specialist fish species from received levels of 205 dB re 1µPa from a single seismic shot [95].

Based on the predicted sound propagation from VSP operations and the thresholds presented in literature, sound levels generated by the VSP source are not expected to be sufficient to result in physiological impacts (e.g. injury, PTS or TTS), as corresponding sound levels are expected to fall below such thresholds within a few metres from the seismic source. With the existing observation and shut down controls in place, marine fauna are highly unlikely to be present in close proximity to the seismic source and soft start procedures will provide marine fauna with advanced opportunity to move away from the source before impacts can occur.

Some behavioural avoidance impacts and masking effects may occur beyond the geographical extent where PTS and TTS impacts can occur. However, sound levels generated from VSP are

(88) Bartol, SM and Musick, JA. 2003. 'Sensory biology of sea turtles', In: Lutz, PL, Musick, JA and Wyneken, J, The biology of sea turtles. CRC Press, Boca Raton, Florida, USA, vol. 2, pp. 79–102.

(89) Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, et al. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. SpringerBriefs in Oceanography, vol. ASA S3/SC1.4 TR-2014. ASA Press. 87 pp.

(90) McCauley, RD, Fertrell, J, Duncan, AJ, Jenner, C, Jenner, MN, Penrose, JD, Prince, RIT, Adihyta, A, Murdoch, J and McCabe, K. 2000. Marine seismic surveys: analysis and propagation of airgun signals, and effects of exposure on humpback whales, sea turtles, fishes and squid. Perth: Prepared for the Australian Petroleum Exploration and Production Association from the Centre for Marine Science and Technology, Curtin University.

(91) National Science Foundation (U.S.), U.S. Geological Survey, and [NOAA] National Oceanic and Atmospheric Administration (U.S.). 2011. Final Programmatic Environmental Impact Statement/Overseas. Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey. National Science Foundation, Arlington, VA.

(92) Ladich, F. 2000. Acoustic communication and the evolution of hearing in fishes, Philosophical Transactions of the Royal Society of London B, vol. 355, pp. 1285-1288.

(93) Finneran, JJ and Hastings, MC. 2000. A mathematical analysis of the peripheral auditory system mechanics in the goldfish (Carassius auratus), Journal of the Acoustical Society of America, vol. 108, iss. 3, pp. 3035–3043.

(94) Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, et al. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. SpringerBriefs in Oceanography, vol. ASA S3/SC1.4 TR-2014. ASA Press. 87 pp.

(95) Popper A.N., Smith M.E., and Cott P.A. 2005. Effects of exposure to seismic airgun use on hearing of three fish species. J. Acoust Soc Am 117:3958–3971.

predicted to attenuate below levels that result in impacts within a short distance from the source and, therefore, such effects on marine fauna are expected to be localised and only affect a small number of transient marine mammals, turtles and fish for the short duration when the VSP source is in operation (about ten hours per well site). Marine fauna is expected to return to their normal behaviour once sound levels have attenuated or VSP activities have ceased, with no lasting effects for individuals and no impacts at population level expected.

The magnitude of impacts from temporarily increased sound levels associated with VSP operations is therefore **Small**.

Marine mammals and turtles are considered highly sensitive receptors as some of the species present in the waters of the Ayeyarwady Region are considered international and national species of conservation concern. Based on the **High** ranking for receptor sensitivity attributed to marine mammals and turtles, it is anticipated that, with all the existing control measures in place, the impact will be of **Moderate** significance for marine mammals and turtles (*Table 6.21*).

Fish are not considered to be as sensitive to underwater sounds as marine mammals. However, taking into account the potential presence of some hearing specialist species, sensitivity is conservatively ranked as **Medium.** With all the existing control measures in place, the impact will be of **Minor** significance for fish (*Table 6.22*).

Table 6.21 Assessment of Impacts from an Increase in Ambient Underwater Sound Resulting from VSP Operations on Marine Mammals and Turtles

Impact	Increase in underwater sound leading to behavioural changes to transient marine mammals and turtles				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Localised behavioural changes to a small number of individuals.				
Frequency	Once for about ten hours per well site				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

Table 6.22 Assessment of Impacts from an Increase in Ambient Underwater Sound Resulting from VSP Operations on Fish

Impact	Increase in underwater sound leading to behavioural changes to fish				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Localised behavioural changes to a small number of individuals.				
Frequency	Once for about ten hours per well site				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

Additional Mitigation, Management and Monitoring

The control measures adopted by the Project are considered international good practice for reducing the impact of underwater sound from VSP operations on marine fauna (marine mammals, turtles and fish).

Significance of Residual Impacts

The residual impacts from an increase in underwater sound levels associated with VSP operations are considered likely to be of **Moderate** significance for marine mammals and turtles and of **Minor** significance for fish).

6.4.4 Impacts on Fishing Activity and Shipping from Physical Presence of MODU and Vessels

Source of Impact

The following section assesses the impacts to fishers from potential physical disturbance due to the presence of the MODU and support vessels based on the areas / locations in which they fish as defined in *Section 5.4.5.* The assessment excludes the local fishermen who fish in rivers or out to 7 miles (11 km). The assessment will focus on fishing activity in deep water (water depth of about 7870 ft (2400 m) and distance from the mainland coast (21 miles (35 km) at the closest point).

Temporary disturbance of fishing activities may occur due to the presence of the MODU and support vessels and implementation of the 1640 ft (500 m) safety exclusion zone. The safety exclusion zone when in effect will exclude fishing activity and therefore, potentially prevent fishing activity by fishers active in the area at the time of the drilling activity.

The winter season (November to April) is the key fishing season, however, large commercial trawlers from outside the Ayeyarwady Region fish throughout the year. Fishing boats likely to be in offshore waters are large (> 90 ft in length) and have navigational systems such as GPS.

Existing/ In Place Controls

In order to ensure potential impacts from the proposed drilling program on the fishers and the fishing community are avoided or reduced as far as possible, the following control measures are planned:

- A 1640 ft (500 m) radius safety exclusion zone will be maintained around the MODU as required. The Vessel Master will endeavour to manage vessel access and activities within this zone.
- MODU and support vessels (as per vessel class) will comply with international regulations for collision avoidance, navigation and maintenance including:
    - Maintaining look-outs (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar).
    - Navigation light display requirements, including visibility, light position/shape and noise signals appropriate to activity.
    - Maintenance of minimum safe manning levels.
    - Maintenance of navigation equipment in efficient working order (compass/radar / communications).
    - Navigational systems and equipment as specified in Regulation 19 of Chapter V of SOLAS.
    - Automatic Identification System installed (as applicable or required by vessel class) in accordance with Regulation 19 of Chapter V of SOLAS.
- Myanmar speaking (crew members) available on board the MODU.
- Implementation of the Stakeholder Engagement Plan (SEP) to ensure timely sharing of information on the details of the proposed drilling program in order to inform stakeholders. A Notice to Mariners will also be included in the SEP.
- Disclosure and implementation of the Grievance Mechanism for the Project and timely investigation of any grievances.

Significance of Residual Impacts

The communication of timely information will help to raise awareness of drilling and potential disturbance to fishing activity to help fishers to avoid the MODU and support vessels, and the 1640 ft (500 m) exclusion zone. It is important to note that only one of the wells will be drilled at any given time therefore ensuring the area the fishing vessels would need to avoid represents a very small proportion of the total fishing area available to fishing vessels and any resulting impact is considered to be highly localised.

In addition, the Project will have support vessels which will communicate with fishing vessels they encounter while at sea. Once the MODU and support vessels leave the area, fishing vessels will be able to return to the area minimising the overall time that fishing is restricted in a particular area.

Larger commercial fishing vessels from other regions in Myanmar and other countries may be present within and in the vicinity of the Project Area. These vessels, however, tend to have larger fishing grounds with highly developed navigational and communication systems which will be able to easily avoid the exclusion zone around the vessels and equipment. Therefore, displacement from one area will be of negligible magnitude.

With the existing control measures in place, it is expected that the impacts on fishing activities are likely to be **Negligible** and impacts on livelihoods will also be **Negligible** (*Table 6.23*).

Table 6.23 Assessment of Impacts from Physical Presence on Fishermen and Shipping

Impact	Fisheries Activity and Livelihoods				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Impact scale will be limited to a relatively small number of vessels (compared to the overall number of vessels engaged in fishing) in the deep water.				
Frequency	Duration of the proposed drilling activities – (about 60 days per well)				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

Additional Mitigation, Management and Monitoring

Given the measures in place, no additional mitigation is required. However, a grievance mechanism will be developed by Woodside and implemented to provide an avenue for stakeholders, including those in fishing communities, to raise concerns with the Project and provide a process for timely resolution of grievances. While this measure does not affect the impact significance, it has been included as an important component of Woodside's responsibilities to ensure impacts are avoided or reduced as far as practicable.

Communication and information sharing will be implemented to minimise misunderstanding regarding the extent of the exclusion zone and the duration of the activities. Clear information will be provided to ensure that fishers are aware that the Project will not exclude people from their fishing grounds but rather will cause only a temporary disturbance to fishing activities, if any.

Significance of Residual Impacts

It is anticipated that there is likely to be a **Negligible** residual impact caused by disturbance to fishers.

6.4.5 Impacts from Unplanned Spills to Marine Fauna and Habitats

Source of Impact

A number of spill scenarios were identified with a potential for hydrocarbons to be released to the marine environment during the proposed drilling program, these are as follows:

- Accidental spills including deck spills and releases during bunkering.
- Vessel collision during drilling activities or transit to port.
- Breach of MODU fuel tanks due to support/third party vessel collision.
- Dropped object from back-loading/ offloading operations rupturing the MODU fuel tanks (e.g. a container or piece of equipment).
- Loss of well integrity/control leading to a release of reservoir fluids.
- Spill of drilling fluids and cuttings due to initiation of EDS.

Non Credible Scenarios

Loss of Well Integrity leading to the release of reservoir fluids

A loss of well integrity/control is an uncontrolled release of liquid reservoir fluids to the surface, resulting from an over-pressured formation fluid (gas or other fluids). Woodside has identified a blowout as the scenario with the worst environmental outcome as a result of loss of well integrity. A blowout is an incident where formation fluid flows out of the well or between formation layers after all the predefined technical well barriers (e.g. the blowout preventer) or activation of the same has failed (LR 2015). Blowout probability for an exploration well was estimated to be 3.1×10^{-4} per well (DNV, 2011 and OGP 2010 for North Sea data). This is based on data from the Gulf of Mexico, United Kingdom and Norway from 1980–2004, including wells that had BOPs installed.

Woodside Energy Ltd. has a good history of implementing industry standard practice in well design and construction. In the company's 60 year history it has not experienced any well integrity events that have resulted in significant releases or significant environmental impacts.

Analysis of the A-6 deep water prospects has indicated that the target hydrocarbons are expected to be dry gas based on offset well and field data. Dry gas was encountered at the Shwe Yee Htun-1 well in A-6.

The effect of the physical extent of a gas plume from a well blow out in the environment is expected to have a limited, localised impact on the marine environment such as the physical displacement of transient and/or mobile fauna. The extent of the plume is expected to be relatively small in comparison to the surrounding offshore, deep water environment and overall potential impacts to marine biota and the marine environment are generally expected to be of minor significance.

A loss of well integrity/control event leading to the uncontrolled release of reservoir fluids is not considered a credible risk given the hydrocarbons are expected to be dry gas with no liquid hydrocarbons present.

Controls will be in place with respect to implementation of Woodside's Well Lifecycle Management Process (WLMP), Well Barrier Engineering Standard and Well Control Engineering requirements to ensure well design, construction and operation are managed and controlled. The mitigation measures listed reflect the WLMP process requirements. Woodside's Well Barriers Engineering Standard includes the following requirements:

- Discrete hydrocarbon zones shall be isolated from each other (to prevent cross flow) by a minimum of one barrier.
- All permeable zones penetrated by the well bore, containing hydrocarbons or over-pressured water, shall be isolated from the surface environment by a minimum of two barriers (a single fluid barrier may be implemented during the initial stages of well construction if appropriateness is confirmed by a shallow hazard study).

- All normally pressured permeable water-bearing formations shall be isolated from the surface by a minimum of one barrier.
- Barriers shall be effective over the lifetime of well construction or production.
- Effectiveness of primary and secondary barriers shall be verified (physical evidence of the correct placement and performance).
- Woodside's Well Control Engineering requirements for a fluid barrier comprising drilling fluid of a suitable weight, composition and volume to counter pore pressure and over pressure zones when drilling.
- Subsea BOP specification and function/pressure testing will be undertaken in accordance with API Standard 53 4th Edition (API 53), requiring the following:
    - One annular preventer.
    - Two pipe rams (excluding the test rams).
    - A MODU is required to have a minimum of two sets of shear rams, one of which must be capable of sealing.
    - On activation of the shear ram the drill string can be sheared and after the sealing blind shear rams are closed a seal is provided which creates a barrier to the reservoir to reduce/prevent further hydrocarbon discharges.
    - If the BOP's operation cannot be achieved from the MODU, the rams within the BOP can be operated by ROV.

An EDS may be implemented if the MODU is required to rapidly disengage from the well. The EDS closes the BOP and disconnects the riser to break the connection between the wellhead and MODU. Common examples of when this system may be initiated include the movement of the MODU outside of its operating circle, or the movement of the MODU to avoid a vessel collision. EDS aims to leave the wellhead in a secure condition but will result in the loss of the drilling fluids/cuttings in the section of the riser from the well head to the MODU following disconnection. The environmental aspects of these unplanned drilling activities are the same as those for undertaking the Project and are considered to be adequately addressed by this EIA Report. No significant changes to existing environmental risks or any additional environmental risks are considered likely.

A breach of the MODU fuel tanks due to a third party or support vessel colliding with the MODU was determined to be non-credible. This is based on the estimated impact energy resulting from a support vessel collision expected to be insufficient to result in damage to the MODU fuel tanks and in the worst case only minor structural damage to the MODU would be anticipated.

A dropped object such as a container or piece of equipment during back-loading/ offloading operations rupturing one of the MODU fuel tanks was also not considered to present a credible spill scenario. This was based on the lack of sufficient impact energy, position of the fuel tanks on board the MODU and the implementation of approved plans and procedures to prevent dropped objects.

Credible Spill Scenarios

The credible spill scenarios for the proposed drilling program were assessed as accidental spills on deck, during bunkering, and the rupture of a vessel fuel tank resulting from a vessel collision.

Spills on deck can occur due to accidental releases from stored hydrocarbons, chemicals, or NADF, or from equipment present on the deck such as small quantities of lubricating oils, hydraulic fluid or other chemicals. Hydraulic fluid is also contained in hoses and lines and on hydraulic equipment, such as cranes or winches.

The potential loss of fuel during bunkering operations may occur due to a partial or total failure of a bulk transfer hose or fittings. If this were to occur, automatic fail safe responses on the bunker

vessel will shut down the transfer immediately, and losses would be confined to the volume of the hose and connections (up to 8 m^3) which would spill onto the deck or into the marine environment. All vessels will use MGO as fuel.

In the event of a vessel collision, a fuel tank may rupture resulting in the release of fuel to the marine environment. For such an incident to occur, the collision must have enough impact energy to penetrate the vessel hull, and be in the location of the fuel tanks in order to result in rupture of a fuel tank. In this unlikely event, the potential spill volume is expected to be about 105 m^3 of MGO.

The credible spill scenarios for the proposed drilling program are accidental spills on deck and during bunkering, and the rupture of a vessel fuel tank resulting from a vessel collision. The scenario with the greatest potential for impacts is a spill of MGO from a fuel tank rupture and therefore the magnitude of the impacts assessed in this section has been determined based on this scenario.

Potential impacts from unplanned spills may include:

- Toxic effects to marine biota.
- Decline in water quality.
- Physical oiling of marine megafauna and avifauna.

Impacts to marine mammals, marine turtles, fishes and seabirds which may be found within the offshore area are discussed below.

Marine Mammals

Marine mammals are mobile and a number of field and experimental observations indicate whales and dolphins may be able to detect and avoid surface slicks from fuel spills [96]. Nevertheless, observed instances have occurred where whales and dolphins have swum into oiled areas without seeming to detect the slicks, or because the slicks were unavoidable. Marine mammals exposed to surface slicks in the event of an MGO spill, are at risk of lethal and sub lethal effects from inhalation of volatile components, as well as skin contact and/or ingestion of hydrocarbons at concentrations greater than 10 g/m^2 [97][98]. Fouling of whale baleen may disrupt feeding by reducing the ability to take in prey, while toothed whales including dolphins, which are gulp feeders, may be less susceptible. Given the relatively small volumes of hydrocarbons associated with the credible spill scenarios (about 105 m^3) and the tendency for MGO to evaporate rapidly, the potential for environmental impact (both lethal and sub lethal) to marine mammals from a surface spill of hydrocarbons is considered unlikely.

Seabirds

The waters of the Ayeyarwady region are potential foraging grounds for seabirds that are vulnerable when coming into contact with surface slicks during feeding or resting on the sea surface. Physical contact of seabirds with surface slicks may result in fouling of feathers causing them to matt and lose their insulating, buoyancy and water-repelling properties. This may also lead to mortality as birds sink and drown, due to hypothermia (loss of thermoregulation) or as they lose the ability to fly leading to starvation. Physical contact with slick or vapours can also cause irritation and injury to a bird's eyes, skin and mouth cavities. Ingestion and inhalation of hydrocarbons from preening can damage internal organs, suppress immune system and reduce reproductive success [99] [100]. This may also lead to mortality due to oiling of feathers or the ingestion of hydrocarbons.

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(96) Smith TG, Geraci JR and St Aubin DJ (1983) Reaction of Bottlenosed Dolphins *Tursiops truncatus* to a controlled oil spill. *Canadian Journal of Fisheries and Aquatic Sciences* 40:1522-1525.

(97) Etkins, D.S. (1997) The impacts of oil spills on marine mammals. OSIR Report – Special Report. OSIR.

(98) IPIECA (International Petroleum Industry Conservation Association) (1995). Biological Impacts of Oil Pollution: Rocky Shores, International Petroleum Industry Environmental Conservation Association, No. 7.

(99) AMSA (Australian Maritime Safety Authority) (2012) The effects of maritime oil spills on wildlife including non-avian marine life. http://www.amsa.gov.au/marine_environment_protection/national_plan/general_information/oiled_wildlife/oil_spill_effects_on_wil

(100) IPIECA (International Petroleum Industry Conservation Association) (1995) *Op. cit.*

Significant aggregations of target prey species are not expected to occur given the lack of seabed features in the water depths of about 7870 ft (2400 m). Given the maximum volume of credible hydrocarbon spill (105 m^3) would result in a highly localised spill, the tendency for MGO to evaporate rapidly, and the distance from major prey aggregations, foraging seabirds are not expected to be encountered in significant numbers at the drilling location and are therefore unlikely to be affected by a hydrocarbon spill.

Marine Turtles

Marine turtles are not known to exhibit avoidance behaviour when they encounter an oil slick (101) and contact with slicks can result in hydrocarbon adherence to body surfaces (102) causing irritation leading to inflammation and infection (103). Oiling can also irritate and injure skin which is most evident on pliable areas such as the neck and flippers (104).

As discussed previously, given the volume of a potential spill, exposure to a surface slick would be highly localised. While marine turtles (adults, hatchlings and juveniles) may be present in the area affected by a spill, they are not expected to be present in significant numbers. Given the limited extent of surface hydrocarbon exposure and rapid weathering of MGO, impacts to marine turtles are expected to be confined to individuals and would not have any population-wide effects. The duration of impact would also be limited.

Fish

Fish mortalities are rarely observed to occur as a result of oil spills, especially in open water environments (105) such as the Project Area. This is often attributed to pelagic fish being able to detect and avoid oil spills by swimming into deeper water or away from the affected areas. Due to the limited duration and spatial extent of hydrocarbon exposure, fish are unlikely to be impacted.

Existing/ In Place Controls

Measures to control/ minimise adverse impacts from unplanned spills will include:

- Vessel standard operating procedures and a bunkering plan will be prepared and implemented.
- MODU and support vessels (as applicable or required by vessel class) operate in compliance with MARPOL 73/78 Annex I (Reg. 7, 17 and 37) including:
    - Regulation 7: Vessels will hold a valid International Oil Pollution Prevention (IOPP) Certificate.
    - Regulation 17: Vessels will maintain an oil record book.
    - Regulation 37: Shipboard Oil Pollution Emergency Plans (SOPEPs) to be developed as appropriate to class.
- Chemicals and/or hydrocarbons will be handled and stored in compliance with the Safety Data Sheet (SDS).
- All chemical and/or hydrocarbon wastes will be segregated into clearly marked containers prior to onshore disposal by a licensed waste management contractor, as per the relevant SDSs.

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(101) Odell, DK. and MacMurray, C. (1986) Behavioural Response to Oil. Final Report: Study on the Effect of Oil on Marine Turtles. S. Vargo, Lutz, PL., Odell, DK., VanFleet, T. and Bossart, G., Mineral Management Services Contract.

(102) Gagnon, MM. and Rawson CA. (2010) Montara Well Release: Report on necropsies from a Timor Sea green sea turtle. Perth, Western Australia, Curtin University: 15.

(103) Etkins, D.S. (1997) *Op. cit.*

(104) Lutcavage, ME., Lutz, PL., Bossart, GD., and Hudson, DM. (1995) Physiologic and clinicopathological effects of crude oil on loggerhead sea turtles. Archives of Environmental Contamination and Toxicology 28: 417-422.

(105) ITOPF (International Tank Owners Pollution Federation) (2011) Effects of Oil Pollution on the Marine Environment. Technical Information Paper. Technical paper No. 13. The International Tank Owners Pollution Federation Limited.

- Spill response kits will be located in proximity to hydrocarbon storage/bunkering areas and appropriately stocked/replenished as required.
- Bunkering undertaken in accordance with operational bunkering procedures including:
  - Use of dry break couplings (or similar) for flexible fuel transfer hoses.
  - Bunkering to commence during daylight hours and appropriate sea conditions.
  - Visual monitoring of gauges, hoses, fittings and the sea surface.
- MODU and support vessels (as per vessel class) will comply with international regulations for collision avoidance (COLREGs 1972), navigation and watch-keeping, including:
  - Maintaining look-outs (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar).
  - Navigation light display requirements, including visibility, light position/shape and noise signals appropriate to activity.
  - Maintenance of minimum safe manning levels.
  - Maintenance of navigation equipment in efficient working order (compass/radar / communications).
  - Navigational systems and equipment as specified in Regulation 19 of Chapter V of SOLAS.
  - Automatic Identification System installed, as applicable or required by vessel class, in accordance with Regulation 19 of Chapter V of SOLAS.
  - Establishment of a 1640 ft (500 m) safety exclusion zone around the MODU.
  - Woodside Oil Pollution Emergency Plan (OPEP) developed and implemented in the event of a spill resulting from a vessel collision or bunkering spill beyond the capability of the SOPEP.

Significance of Residual Impact

The above controls help reduce the likelihood and/or impact of a potential spill. If a fuel spill does occur, it will be highly localised and will evaporate and disperse rapidly in the offshore environment of the Project Area.

As discussed above, spills related to the Project are unlikely to have significant impacts on the marine environment or species. Vessels will not operate near the coast of Ayeyarwady; therefore there are no nearshore habitats or species that will be affected in the event of a spill. Given only small volumes are likely in the event of a spill, the considerable distance of the Project Area (about 21 miles (35 km) at the closest point) from sensitive coastal habitats, and the highly dispersible nature of the fuel, a spill would only affect water quality and marine fauna in close proximity to the spill release location. In addition, large marine fauna (fish, turtles and mammals) may exhibit avoidance behaviour and move away from the spill-affected area.

Any spills to the marine environment from the Project will likely result in a negligible magnitude impact. Marine fauna and habitats that may be impacted by an oil spill have varying degrees of sensitivity. However, the impact would be of **Negligible** significance overall (*Table 6.24*).

Table 6.24 Assessment of Impacts from Accidental Spills on Marine Fauna and Habitats

Impact	Water contamination and secondary impacts to biodiversity from accidental spills				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Localised potential to impact a small number of individuals.				
Frequency	Infrequent.				
Likelihood	Rare				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

Additional Mitigation, Management and Monitoring

Provided that the control measures are in place, the likelihood of a spill occurring is unlikely and no additional mitigation is required. Preventative controls designed to avoid spills, or contain and prevent spills from reaching the marine environment will be implemented via compliance with legislative requirements and Woodside procedures.

Significance of Residual Impacts

The residual impacts from an unplanned spill are considered likely to be of **Negligible** significance for all marine fauna and habitats.

6.4.6 Impacts from Unplanned Collisions on Fishing Vessels and Other Marine Users

Source of Impact

Potential unplanned collisions between fishing vessels / other shipping and drilling activities may result in damage to fishing gear (e.g. nets / lines damaged), damage to vessels or sinking of vessels. Additional concerns associated with interactions with other vessels include potential for concomitant pollution effects (fuel oil spillage). The potential impacts from an accidental release of fuel are provided in *Section 6.4.5.*

Any damages to fishing gear may adversely impact the fishermen who would have to pay for replacement gear and would not be able to fish until the damages are fixed. This could lead to secondary effects on fishing communities through a reduction in fishing revenue.

The south-west corner of A-6 overlaps with this shipping lane but A-6 is not located in the section most frequently used navigation route for shipping. The issues associated with other marine users are the same as those mentioned above for fishing except for damage to fishing gear.

Existing/In Place Controls

The existing controls for fisheries and other marine users from unplanned collisions will be the same as those mentioned for impacts on fishing activity from the physical presence of the MODU and support vessels in *Section 6.4.4.* The MODU and support vessels will also be equipped with extensive navigation, radio/satellite communication equipment and dual radar systems.

Significance of Residual Impacts

The MODU will be accompanied at all times by three to four support vessels that would act as fishing liaison as well as look out for the presence of other marine users.

In addition, there is unlikely to be any fishing vessels from the Ayeyarwady region in the Project Area as fishermen fish out to 7 miles (11 km) from the coast. These fishing vessels have lower navigational abilities than the larger trawlers and purse seiners. The fishing vessels that may be

present in the Project Area have fishing grounds that cover a wide area (*Figure 5.4*) and also have on-board advance navigational and communication systems to warn them of the presence of the MODU. This also holds true for the vessels originating from Thailand.

The shipping lane that transects the south-west corner of A-6 is not heavily used (refer to *Figure 5.12*). Shipping vessels in transit with a good standard of navigational equipment can easily avoid Project activities without disruption. The Project Area is outside of the main shipping lane and therefore the potential for encountering shipping is low.

Given the measures in place, the risk of collision between the MODU, support vessels and fishing vessels or other marine users is considered of **Negligible** significance (*Table 6.25*).

Table 6.25 Assessment of Impacts from Unplanned Collisions on Fishing Vessels and Other Marine Users

Impact	Unplanned Collisions				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Affects the vessels using A-6.				
Frequency	Duration of the proposed drilling activities – not more than 60 days per well.				
Likelihood	Unlikely.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium (Fishing vessels)	High (livelihoods)		
Impact Significance	Negligible	Minor	Moderate	Major	

Additional Mitigation, Management and Monitoring

Given the measures in place, no additional mitigation is required. However, a grievance mechanism will be developed and implemented to provide an avenue for stakeholders, including those in fishing communities, to raise concerns with the Project and provide a process for timely resolution of grievances. Although this measure does not affect the impact significance, it has been included as an important component of Woodside's responsibilities to ensure impacts are avoided or reduced as far as practicable.

Communication and information sharing will be implemented to minimise misunderstanding regarding the extent of the exclusion zone and the duration of the activities. Clear information will be provided to ensure that fishers are aware that the Project will not exclude people from their fishing grounds but rather will cause only a temporary disturbance to fishing activities, if any.

Significance of Residual Impacts

The impacts on fishing vessels and other marine users are considered likely to be **Negligible**.

6.4.7 Monitoring Program

Monitoring will be implemented to demonstrate compliance with both regulatory and Woodside's internal procedure and, will also provide verification of the effectiveness of the implemented control measures.

Compliance will be monitored to ensure that subcontractors meet contractual obligations with respect to work practices and design specifications (e.g. Project emission standards).

In developing the monitoring measures, the following considerations and strategies have been applied:

- Consistency with internationally and locally acceptable practices.

- Logistically practical.
- Cost effectiveness.

Refer to *Section 4.1* of the separate EMP Report for this Project for more details on the monitoring program.

6.4.8 Summary of Impacts

The key potential impacts associated with the Project and required mitigation measures are summarised below and in *Table 6.26*:

- The contribution of GHG emissions arising from combustion emissions from the MODU, support vessels, machinery engines and flaring;
- Potential impacts from drill cuttings and drilling fluid discharge on water quality, sediment quality and pelagic and benthic communities;
- Increases in ambient underwater sound and generation of sound pressure levels from short duration VSP, causing disturbance to marine mammals, marine turtles and fish that may be present within A-6;
- Short-term disturbance to offshore commercial fishing activities and shipping/navigation within A-6 due to the presence of the MODU and support vessels during drilling activities;
- Potential water contamination and secondary impacts to biodiversity and fishing activities from accidental spills or leaks (e.g. vessel collision, deck spills or during offshore re-fuelling) or the unplanned release of NADF; and
- Potential impacts from unplanned collisions on fishing vessels and other marine users due to the presence of the MODU and support vessels during drilling activities.

Table 6.26 Summary of Potential Impacts and Residual Impact Significance

Potential Impact/Issue	Control / Mitigation Measures	Significance of Residual Impact
Impacts from drill cuttings and drilling fluid discharges to sediment quality, benthic communities, water quality, fish and pelagic communities	• WBDF shall be used as the first preference and where WBDF cannot meet required specifications, NADF may be used following technical justification. • The average oil content for discharge of NADF pit cleaning slops will be limited to less than 1% by volume. • Average oil on cuttings for the wells will be limited to 6.9% or less by weight. • Residual NADF will be disposed of downhole, or returned to shore for reconditioning, re-use or disposal. • No bulk discharge of NADF drilling fluids will be permitted offshore. • Where cuttings are discharged overboard, they will be discharged below the water line. • NADF system set up via the Woodside NADF Start-up Checklist. • All chemicals that may be discharged to the marine environment during the exploration drilling activity will be selected and approved as per the Woodside Chemical Assessment Process. • All Woodside approved chemicals are included on the Chemical Selection List which is regularly reviewed. • Bulk operational discharges conducted under the MODU's PTW system (to operate discharge valves/pumps).	**Negligible** (sediment quality, benthic communities, fish and pelagic species) **Minor** (water quality)

Potential Impact/Issue	Control / Mitigation Measures	Significance of Residual Impact
Impacts from underwater sound on marine fauna	• 0.6 miles (1 km) visual observation zone. • Pre-start observations and soft start procedures. • Visual observations of the observation zone (0.6 miles; 1 km) must be maintained continuously for whales or turtles. • 1,640 ft (500 m) precautionary shut-down zone. • Night-time / low visibility procedures. • Pre-start meeting with crew to include marine fauna observations and reporting requirements. • During periods of low visibility, VSP may be used as described in soft start and operating procedures provided that there have not been three or more whale shut down situations during the preceding 24 hours or if operations were not underway during preceding 24 hours, no whales were sighted in two hour period during preceding 24 hours. • A trained crew member will be utilised during VSP operations to monitor and record marine fauna.	**Minor** (fish) **Moderate** (marine mammals and turtles) but considered ALARP*
Impacts on fishing activity and shipping from physical presence of MODU and vessels	• A 1640 ft (500 m) radius safety exclusion zone will be maintained around the MODU as required. • MODU and support vessels will comply with international regulations for collision avoidance, navigation and maintenance. • Myanmar speaking crew members available on board the MODU.	**Negligible** (fishing and shipping)
Impacts from unplanned collisions on fishing vessels and other marine users	• Implement the SEP to ensure timely sharing of information on the details of the proposed drilling program in order to inform stakeholders. • Issue Notice to Mariners. • Disclosure and implementation of the Grievance Mechanism for the Project and timely investigation of any grievances.	**Negligible** (fishing, shipping and livelihoods)
Impacts from GHG emissions from the MODU, support vessels, machinery engines and flaring	• The well test duration will be minimised to the extent possible. • Energy efficient design and operation of machinery. • Engine maintenance to minimise unburned hydrocarbons. • The MODU and support vessels will have IAPP certificates (as applicable or required by vessel class). • Vessels (as applicable or required by vessel class) will have a SEEMP. • Use of low Sulphur fuel (sulphur content not to exceed 3.5% m/m) when it is available.	**Negligible** (atmosphere and climate)
Impacts from unplanned spills on marine fauna and habitats	• Vessel standard operating procedures and bunkering procedures (including limiting commencement of bunkering to daylight hours, visual monitoring, and dry break couplings). • MODU and support vessels (as applicable or required by vessel class) operate in compliance with MARPOL. • Vessels will hold a valid IOPP certificate, maintain an oil record book, and have a SOPEP on board. • Vessels will hold the OPEP on board to implement in a spill incident requiring capability beyond the SOPEP. • Chemicals and/or hydrocarbons handled and stored in accordance with SDS. • Appropriate waste segregation and disposal. • Spill response kits on board vessels and the MODU. • Standard maritime safety/navigation procedures.	**Negligible** (marine fauna, seabirds, fish)

* Note that although the residual impact significance is the impact itself, with the proposed existing controls in place, it is considered to be reduced to a level that is ALARP. As such, it is considered that the moderate impacts are being managed effectively and efficiently.

7 CUMULATIVE IMPACT ASSESSMENT

This section presents the CIA which includes identification of existing and/or potential Projects or activities which could cause cumulative impacts, the impact assessment methodology, and, recommendations for the mitigation measures, if required. Cumulative impacts refer to the additional impacts that may be generated by other developments or activities in the vicinity of the Project Area that when added to the impacts of the Project combine to cause a greater impact. Such impacts may arise due to spatial overlap (e.g. overlap in spatial extent of water quality changes) or temporal overlap (e.g. underwater sound impacts caused by VSP activities at the same time from different sources).

7.1 IMPACT ASSESSMENT METHODOLOGY

The methodology adopted for the CIA is the same as the methodology presented in *Section 6*. Receptors are given the same sensitivity; however, impact magnitude will consider the cumulative effect from the Project and the other projects / activities under consideration. The Methodology adopted is presented in *Section 6.1*.

A CIA considers the residual impacts reported for the Project and evaluates these alongside potential impacts from other projects/activities that may affect common resources and receptors. The ultimate goal of this analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually. The CIA will also define the geographic and temporal boundaries to identify other relevant projects or activities, which could interact with the Project. The cumulative assessment will be the same as the impact assessment process and once the initial impact assessment is performed, mitigation and management measures will be developed for all significant impacts and the residual impact will be calculated for each relevant receptor.

7.2 EXISTING OR PROPOSED DEVELOPMENTS IN THE STUDY AREA

A-6 abuts the coastline to the east and is surrounded by other offshore oil and gas blocks: A-5 and AD-3 in the north, AD-4 to the west and AD-5 and A-7 in the south (*Figure 7.1*). At the time of writing there is one known potential planned activities within AD-4 during the proposed drilling program; that is, the possible drilling of one exploration well. Given the duration of the proposed drilling program, it is possible that other seismic activity and or exploration drilling may occur in the neighbouring blocks during the drilling program.

There are no existing oil and gas developments in the Study Area. As described in *Section 5.5.5*, there are number of other users of the Study Area including shipping, commercial fisheries, and local artisanal fishers.

7.3 POTENTIAL IMPACTS AND MITIGATION

Each of the factors identified in the development specific impact assessment has been considered:

- Physical presence.
- Underwater noise.
- Drill cuttings and fluids.
- Gaseous emissions.
- Unplanned spills.

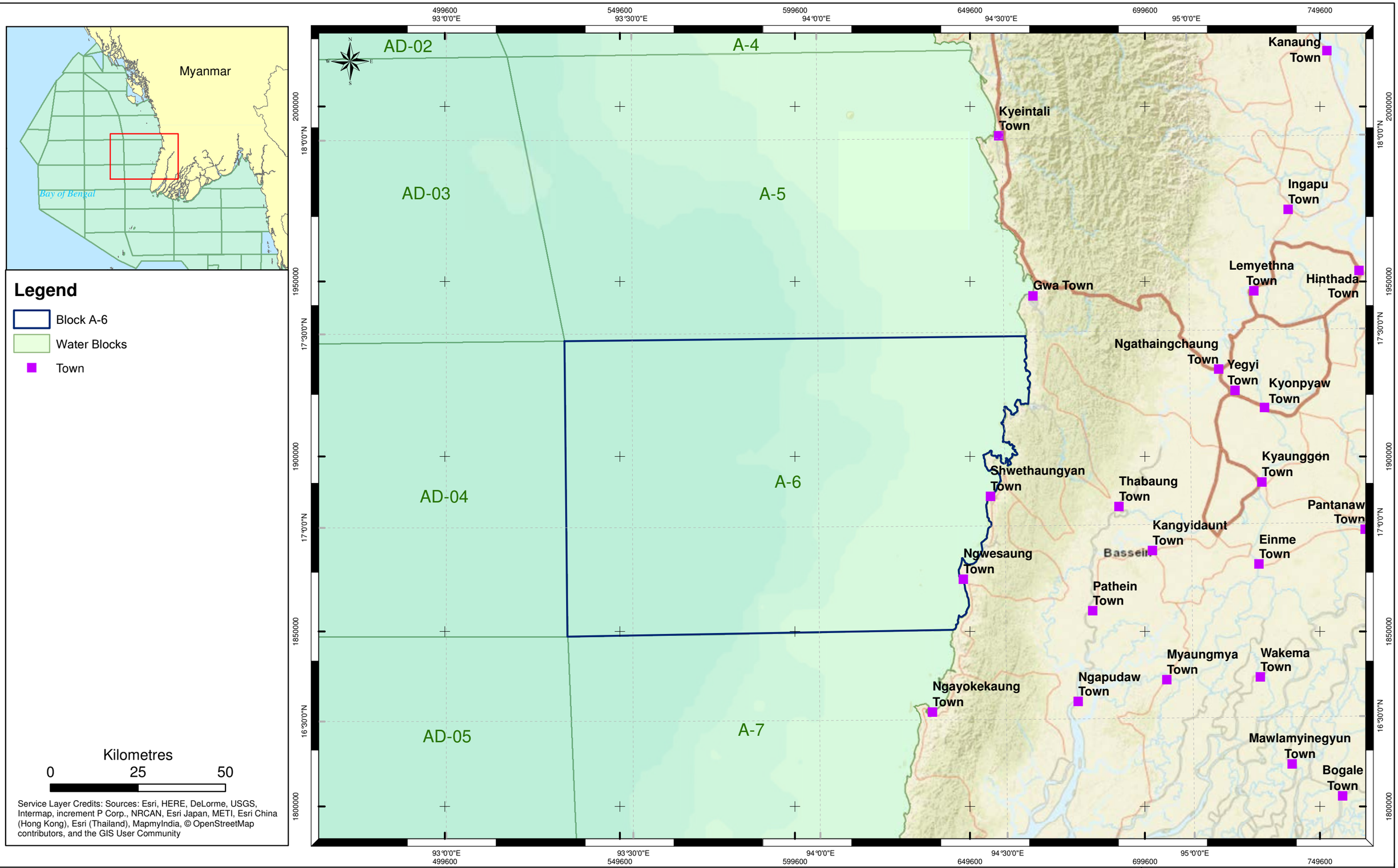

Figure 7.1

Regional Oil and Gas License Blocks

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Date: 14/9/2016

Environmental Resources Management

ERM

7.3.1 Physical Presence

Vessel and helicopter movements are anticipated to occur during the Project, and potentially the neighbouring blocks. Movements will occur in open oceanic waters as well as closer to the mainland for logistical requirements. Possible social impacts arise from the temporary displacement of fishing activity, specifically fishermen that fish near the continental shelf area where the Project Area overlaps with potential fishing grounds, and shipping.

The majority of vessel movements will be in close proximity to the drill location with no overlap in vessel movements expected. Any increases in vessel movements will be negligible and are unlikely to have an impact on commercial fishing or shipping in the area

It is expected that the potential cumulative impacts on fishing or shipping, if properly mitigated, will be localised and the impact will be of **Negligible** significance overall. In addition, only a small number of fishers are expected to fish in or in the vicinity of A-6.

7.3.2 Underwater Noise

Underwater noise generated by VSP will be of limited duration due to the temporary nature of activities (about ten hours of source release within a 24 hour period per well).

Secondary data indicates that underwater noise emissions, similar to those experienced by the Project, were predicted to attenuate to about 160 dB re 1µPa within about 2000 ft (600 m) of the source.

Therefore potential impact from cumulative sound generation, given that the area of impact for Project activities is small (limited to 2000 ft (600 m) around the MODU), distant from neighbouring activities, and of a very short duration (ten hours), the resulting cumulative impacts is considered to be of **Negligible** significance.

7.3.3 Drill Cuttings

Drill cuttings and fluids discharges from other oil and gas projects typically disperse rapidly in close proximity to the discharge point. Due to the distance between the Project and the Shwe Gas Development, cumulative effects are not anticipated.

7.3.4 Gaseous Emission

Gaseous emissions from other oil and gas projects typically disperse rapidly in close proximity to the discharge point. Due to the distance between the Project and any other developments (i.e. from the mainland as there are no offshore developments in the Study Area), cumulative effects are not anticipated.

7.3.5 Unplanned Spills

The risk of cumulative impact of hydrocarbons spills from Project activities within the Rakhine Basin is low as large scale events, though acknowledging that they occur, are extremely rare. The Project will have in place an Emergency Response Plan detailing its spill response. Given the highly unlikely nature of simultaneous spills, and the implementation of standard mitigation measures, impacts would be expected to be of **Negligible** significance.

8 PUBLIC CONSULTATION AND DISCLOSURE

This section presents a summary of the consultation undertaken during the EIA Study, including description of:

- Regulatory and corporate requirements;
- Objectives of consultation;
- Approach and scope of engagement for the impact assessment;
- Format and content of consultation meetings;
- Key issues raised during consultation;
- Future Planned disclosure and consultation activities; and
- Approach for developing a grievance mechanism.

8.1 PURPOSE OF THE CONSULTATION

The specific objectives for stakeholder engagement were to:

- Introduce relevant stakeholders to the JV and its planned Project activities;
- Identify stakeholders and communities potentially affected by Project activities;
- Gather baseline information on the social and biological environment within the Project's Study Area; and
- Engage with potentially affected groups to understand the scope of fishing activities, potential Project impacts, perceptions and concerns and discuss appropriate mitigation measures.

8.2 METHODOLOGY AND APPROACH

8.2.1 Identification of Relevant Stakeholders and Potential Issues

The process of identifying potentially affected stakeholders started with scoping which was conducted for the PPR submitted to MOGE and MONREC in August 2016. The purpose was to identify relevant issues and the townships and villages potentially impacted. The exercise involved both desk-based and preliminary consultation with a number of stakeholders including government authorities.

Given the offshore location of the Project Area and the potential spatial extent of the impacts, it is unlikely that local communities from the adjacent coastline will be impacted so local consultation is focused on fishermen and their representatives.

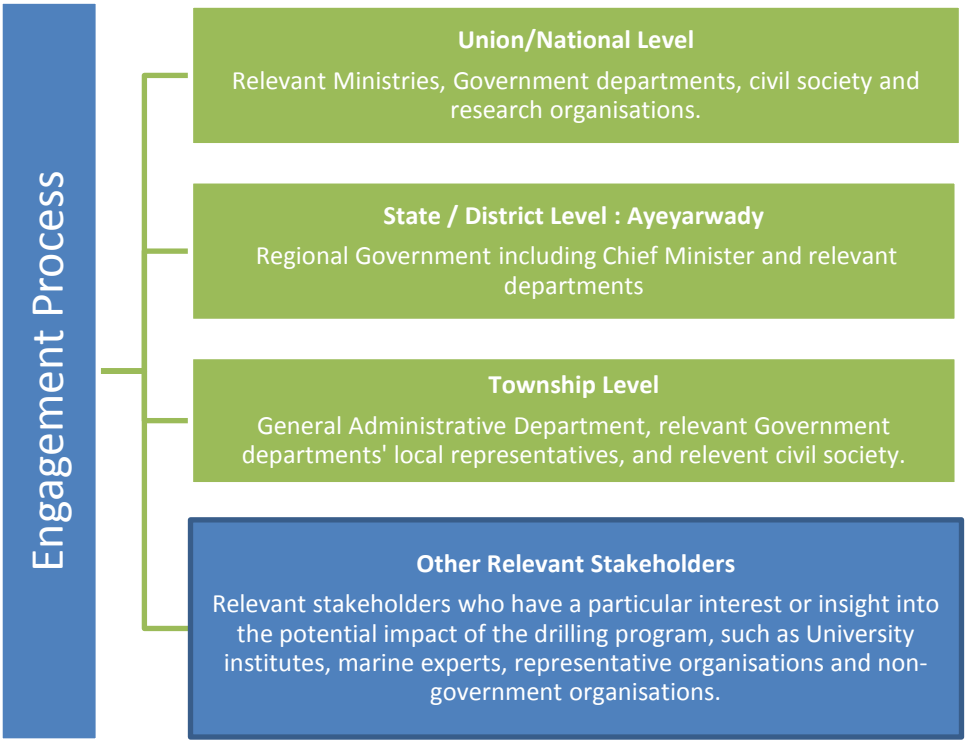
The identification of relevant stakeholders concluded that those offshore fishermen active in and around A-6 would likely be from throughout Myanmar. The process informed planning of the stakeholder engagement process for the assessment and fed into the SEP submitted to MOGE in August 2016.

Stakeholder engagement is an ongoing process and as such new stakeholders may emerge as the Project progresses. Newly identified stakeholders will be incorporated into stakeholder planning.

8.2.2 Overall Approach and Scope of Engagement for the Impact Assessment

Stakeholder engagement was conducted across administrative levels, subject to the permission of responsible authorities [106]. *Figure 8.1* provides an overview of the engagement undertaken including: National Government, Ayeyarwady Region, district and township levels, supported by representative discussion with the village tract leader in a town hall meeting.

Figure 8.1 Engagement with Key Stakeholders



Engagement was undertaken in June 2016. A consultation team led by E Guard and accompanied by Woodside representatives conducted meetings and consultation at the administrative levels. The team was accompanied by a MOGE representative.

National Level

Stakeholder engagement at the national level was focused on government agencies with regulatory and policy making responsibility. The purpose of early engagement was to introduce the Project and Woodside and to seek clarity on the EIA process and requirements related to stakeholder engagement and disclosure. The opportunity was also used to obtain required permissions for engagement with agencies at state and township level and to access government data for the EIA Study.

State Level

Stakeholder engagement at the state level focused on obtaining required permission for engagement activities at the township, village tract and village level and get access to information on offshore and inshore fishing activities in the state. At the state level, the Project representatives met with a delegate of the Chief Minister of Ayeyarwady Region.

(106) Prior to any public consultation in Ayeyarwady, a meeting was held between Woodside, the environmental consultants and the Chief Minister of Ayeyarwady to discuss the proposed Stakeholder Engagement Plan and to obtain permission to visit townships. This meeting was held in June 2016 in Pathein

District / Township Level

Engagement was focused on Pathein District which was considered to be most relevant to the Project as it is the closest. The need for this meeting and the participation was also discussed during the meeting with the Chief Minister's delegate.

Representatives from Shwe Thaungyan Township, Chaungthar Sub-Township and Thabaung Township were invited to participate in a Community Town Hall held in Chaungthar in June 2016. The location of this meeting was recommended by the GAD based on the Project's requirements to engage with coastal communities. This meeting was attended by local GAD, local fishermen from neighbouring villages of Chaungthar, Tha Bock Kan, Wout Thay, Shwe Thaung Yan, Khan Gyi, and Aung Min Glar Kyun as well as local community based organisations (such as the Myanmar Women's Association).

Stakeholders in Chaungthar (townhall meeting in Ayeyarwady) confirmed that local fishermen generally fish within the "inshore" fishing area i.e. within 10 nm (11.5 miles, 18.5 km) of the coast or in rivers in the Delta area. Some large, purse seine fishing vessels (over 90 ft in length) are known to fish up to 30 miles (48 km) from the coastline.

The purpose of engagement was to make the community aware of the Project, seek an understanding of specific issues and stakeholder concerns in the individual townships and village tracts, discuss potential impacts and mitigation measures and obtain district and township level social and environmental data.

The key stakeholders engaged with included;

- GAD
- DoF
- Offshore fishing associations
- Boat owners and traders
- Village tract leaders
- Other organisation representatives etc.

In addition, the Department of Tourism in Chaungthar and Ngwe Saung was contacted for information on key tourism attractions and activities in the area.

8.2.3 Format and Content of Consultation Meetings

Key Principles

The consultation process was guided by the following key principles:

- **Inclusive:** The consultations were organised to ensure representation of potentially affected and interested stakeholders. Separate focus group discussions (FGDs) were undertaken with fishermen and boat owners.
- **Sharing of information:** At the township and village level consultations, emphasis was given to build community level understanding of the Project. All Project information was disclosed in Myanmar language.
- **Participatory:** Stakeholders were encouraged to actively participate in the consultations and were always given the opportunity to ask questions.

The approach to consultation, informed by these principles, is described below.

Consultation Approach

The stakeholder consultation meetings were structured as followed:

- Introductions and information disclosure: Introduce the JV, the Project, the EIA, the proposed stakeholder engagement process, the potential environmental and social impacts and mitigation to help the stakeholders understand the Project and the JV's intentions for engagement.
- Question and answer session for all stakeholders in the town hall meeting to raise concerns, comments or ask questions to which the JV can directly respond.

- Data collection: Collection of more in-depth information through FGDs with key stakeholder groups in a town hall meeting setting. It should be noted that the FGDs were only conducted at the township / district level where village tract leaders were invited to the town hall meetings for consultations.
- In order to inform stakeholders about the Project and its activities, a two page flyer was distributed in the townships visited which contained Project information and details on how to provide feedback into the Project. All information was communicated through use of visual media (including posters and power point presentations) and was provided in local Myanmar language.

FGDs were undertaken with village leaders with the aim of gathering additional environmental and social baseline data and to identify potentially affected communities. The FGDs were guided by questionnaires covering:

- Fishing Methods: information on number / type of boats, fishing season, fishing locations, fishing camps, trip duration and fishing gear used.
- Environment: information on type of fish caught, sighting of marine mammals and turtles, locations of sensitive habitats (coral reefs, seagrass beds, and mangroves), locations of turtle nesting beaches, timing of turtle nesting, fish / invertebrate spawning areas, and protected areas.

Visual tools, such as pictures of fishing gear, maps and pictures of marine species, and hands-on activities, such as drawing fishing areas on hard copies of maps, were utilised in order to increase the involvement of the communities in the stakeholder consultation process. All information collected was summarised and confirmed with stakeholders at the end of the discussion. Stakeholders were also given time to share their concerns and views and any further clarifications they required at the end of the meetings.

Any queries raised by the stakeholders were responded to, and also noted to feed into the impact assessment process for the EIA.

8.3 SUMMARY OF CONSULTATION ACTIVITIES UNDERTAKEN

The key consultations at a regional level and below are highlighted in *Table 8.1.* Photographs taken during public consultations are shown in *Figure 8.2*.

For the public consultation, fishermen, fishing related organisations and other interested parties were invited from villages in the townships and the meeting was attended by representatives from Chaungthar, Tha Bock Kan, Wout Thay, Shwe Thaung Yan, Khan Gyi, and Aung Min Glar Kyun.

Table 8.1 Consultation Activities Undertaken during Scoping and Other Relevant Consultation

Date & Location	Stakeholder	Purpose
2015 – For Seismic Survey and Exploration Drilling undertaken in late 2015 / early 2016		
18 March 2015, Pathein	General Administrative Department (GAD), Ayeyarwady Regional Government (eight Government representatives, including the Chief Minister, of the Ayeyarwady Region)	• Project disclosure • Attain comments and suggestions from Regional Government authorities

Date & Location	Stakeholder	Purpose
28 March 2015, Thabaung Town	Thabaung Township Representatives – Township Administrator, Government representatives, local fisher representatives	• Project disclosure • Answer questions • Provide stakeholders with project contacts
30 April 2015, Pathein	Myanmar Fisheries Federation (MFF) – Ayeyarwady Region	• Project disclosure • Request for information – fishing activities specific to the Ayeyarwady Region
25 May 2015, Yangon	Myanmar Centre for Responsible Business	• Follow-up meeting on progress of Marine seismic survey and exploration drilling consultation activities
28 May 2015, Yangon	Fauna and Flora International	• Project disclosure • Request for information
28 May 2015, Yangon	Wildlife Conservation Society	• Project disclosure • Request for information
29 May 2015, Yangon	Istituto Oikos	• Project disclosure • Request for information
10 June 2016, Yangon	Myanmar Centre for Responsible Business	• Follow-up meeting on progress of Marine seismic survey and exploration drilling consultation activities
24 June 2015, Naypyidaw	Department of Fisheries (DoF)	• Project disclosure • Request for information
2016 – For current Project		
10 June, 2016, MCRB Office	Myanmar Centre for Responsible Business (MCRB)	• Disclose information on the Project. • Request for information.
13 June 2016, Pathein	DoF	• Project disclosure • Request for information
14 June 2016, Chaungthar	Township meeting including representatives from Shwe Thaungyan, and sub township – Chaungthar *	• Project disclosure • Request for information

Date & Location	Stakeholder	Purpose
14 June, 2016, Pathein	Ministerial meeting at the offices of the Chief Minister of Ayeyarwady Region (including Minister of Electric Power, Energy, Industry and transportation, Assistant Director of ECD, Regional Secretary of Pathein GAD and Director of DoF)	• Project disclosure • Request for information • Attain comments and suggestions from Regional Government authorities
16 June 2016, Yangon	MFF	• Project disclosure • Request for information
16 June 2016, Yangon	DoF	• Project disclosure • Request for information
26 October 2016, phone call	Department of Tourism in Chaungthar and Ngwe Saung	• Request for information

* During these consultations, the GAD informed Woodside that there is a new Township “Shwe Thaungyan”, which used to sit inside Thabaung Township. Also within this new township is the sub-township “Chaungthar”. Both the sub-township of Chaungthar and the new township of Shwe Thaungyan use to be included in Thabaung Township. Stakeholders were informed on the Project and were provided an opportunity to voice concern, questions or opinions they may have on the Project.

		
DoF meeting in Pathein	Registration during town hall meeting in Chaungthar	Attendees to town hall meeting in Chaungthar
		
Presentation during town hall meeting in Chaungthar	Focus Group Discussion with Fishermen in Chaungthar	Presentation of information at town hall meeting in Chaungthar

Figure 8.2 Photos from Consultation Activities

8.4 SUMMARY OF MAIN COMMENTS RECEIVED DURING CONSULTATION MEETINGS

During the engagement activities in Chaungthar and Pathein some questions were raised regarding the Project; as provided below. The minutes of the meetings held are provided in ***Annex 7.1***. In general the local community was very supportive of the Project and asked that Woodside consider the future potential for social investment in the area as well as ensuring the protection of the local communities and environment by causing no impacts.

8.4.1 Fishing Interactions

During the townhall meeting it was confirmed that local fishermen generally fish within the "inshore" fishing area i.e. within 10 nm (11.5 miles, 18.5 km) of the coast or in rivers in the Delta area. Some large, purse seine fishing vessels (over 90 ft in length) are known to fish up to 30 miles (48 km) from the coastline.

8.4.2 Impacts to Marine Fauna

One question was asked regarding the use of chemicals in drilling and whether this will have any adverse effect on marine mammals. Woodside responded that the chemicals were selected for low toxicity and as for drilling activities in general, there have not been any demonstrated impacts on marine mammal species. The area of impact is localised to around the well. In addition, the Project will have management plans in place to help reduce any potential impacts from chemical use or accidental spills of fuel or hydrocarbons.

8.4.3 Waste Management

The ECD in Pathein enquired about the management of hazardous and non-hazardous wastes for the Project. Woodside responded that waste management and disposal is considered as part of the EIA Study and is assessed. The Project will also have an EMP which will list out the measures the Project will adopt to manage waste storage, and disposal. The management of wastes will be in line with national and international requirements.

8.4.4 Oil Spill Response

A representative of the ECD enquired about the prevention actions for oil spillage and whether there is an Emergency Response Plan (ERP) for the Project Woodside responded that would have an ERP in place for the Project. This ERP would be informed by the EIA and any potential credible scenarios for spills would be assessed. This assessment identified that a liquid hydrocarbon well blowout was not considered a credible spill scenario. The credible spill scenarios for the proposed drilling program were assessed as accidental spills on deck, during bunkering, and the rupture of a vessel fuel tank resulting from a vessel collision. Further information can be found in Section 6.4.5 Impacts from unplanned spills to marine fauna and habitats.

8.4.5 Woodside's Science Programme

During the meetings, Woodside explained about their current programmes in Ayeyarwady Region. They mentioned that they are working with the Marine Science Department of Pathein University and international NGOs to provide capacity building of the Marine Scientists. This includes swimming and diving skills, and baseline survey skills. One representative from the DoF asked where this training was completed and Woodside responded that is was undertaken in Sinma and Magyipin which are in coastal areas.

8.5 FUTURE ENGAGEMENT AND DISCLOSURE

Stakeholder consultation undertaken to date confirmed that potential impacts as a result of project activities will be small in scale and of limited extent. Given the low degree of likelihood of interaction between Project activities and local fishing activities, further engagement will be limited to offshore / commercial fishermen and / or their representatives and relevant government departments.

Current and future disclosure and engagement activities will consist of the following and are shown in detail in *Table 8.2*:

- Further disclosure of Project information and EIA Report, including opportunities to provide feedback (an example of the disclosure advert is show in *Figure 8.5*);
- Engagement with relevant regional officials/authorities and Government organisations on the outcomes of the Environmental Impact study; and
- Ongoing communications with interested and potentially affected stakeholders during the preparation of the EIA and throughout the proposed drilling program. Although impacts on local communities and other coastal activities are considered unlikely, ongoing project disclosure will be provided to local areas via newspaper and radio advertising and other communication mechanisms (listed in Section 8.2.3).

Throughout the proposed drilling program, the JV will provide activity updates in the form of factsheets and other accessible communications. A grievance mechanism will be in place during operations, in line with the steps required under the EIA Procedure, as well as international good practice [(107)].

If significant issues, concerns or impacts are identified, further stakeholder consultation with interested or affected stakeholders may be undertaken during the proposed drilling program.

(107) Good Practice, as defined by the Myanmar EIA Procedure (2015) means that practice which is recognised by a consensus of relevant stakeholders (including without limitation government, industry, labour, financiers, and academia) as having been adopted by leading, reputable companies of international standard, which is capable of being adhered to within the Republic of the Union of Myanmar, and which, when carried out by or in respect of the Project, can be expected further to reduce the Adverse Impacts arising from the Project and activities related thereto

Table 8.2 Stakeholder communication and notifications

Timing	Purpose	Stakeholder/group	Method of communication/notification
Following lodgement of Scoping Report	Disclose Project information	• Relevant stakeholders at all levels • General public	• Project factsheet distributed via email and fax • Project factsheet available on Woodside website • The disclosure of the A-6 Scoping Report was advertised in the New Light of Myanmar and the Mirror (*Figure 8.3*).
Following lodgement of EIA for assessment	Disclose EIA report to stakeholders	• Relevant regional officials/authorities • Relevant Government organisations	• Hardcopy EIA executive summary (Myanmar) • Regional and nationally advertising – via newspapers and radio. • EIA (English) and executive summary (Myanmar and English) available on Woodside website
During EIA Disclosure	Present findings of the EIA Report when distributing the final Myanmar language ES reports	Relevant stakeholders in Pathein and Chaungthar	Face-to-face
Prior to the commencement of a drilling campaign in any calendar year.	Notification of commencement and location of drilling activities. Outline safety measures and grievance mechanism.	• DoF (Ayeyarwady Region) • MFF (Ayeyarwady Region and Yangon Region) • Relevant regional officials/authorities • Relevant Government organisations • Fishers	• Written notification via factsheet • Publication on Woodside website • Regional advertising
During the Project activities	Provide an update, answer any questions and address any grievances.	Meet with MFF – (Ayeyarwady Region and Yangon)	Face-to-face
During the Project activities	Address any community concerns that may arise during Project activities.	Implement the Community Grievance Mechanism	To be confirmed
On completion of the activity (annually)	Provide an update and answer any questions.	To be confirmed	To be confirmed

ရေနံလုပ်ကွက်အမှတ်- အေ-၆ ဆိုင်ရာ
နယ်မြေပင်တိုင်းတာသတ်မှတ်ခြင်းအစီရင်ခံစာအတွက်ရှေ့ပြေးညှိနှိုင်းခြင်း

Woodside Energy (Myanmar) Pte Ltd (Woodside) သည် မြန်မာနိုင်ငံ၊ ဧရာဝတီတိုင်းဒေသကြီး၊ ကမ်းလွန်ဒေသတွင် တည်ရှိသည့် ရေနံလုပ်ကွက်အမှတ် အေ-၆ တွင် ရေနံတူးတူးဖော်မည့် အစီအစဉ်တစ်ရပ်အား အကောင်အထည်ဖော် ဆောင်ရွက်လျက်ရှိပါသည်။ ရေနံတွင်းတူးဖော်ခြင်းအား တိကျစွာနေရာယူနိုင်သည့် ရွေ့လျားကမ်းလွန်ရေနံတွင်းတူးပလပ်ဖောင် (MODU) အားအသုံးပြု၍ ၂၀၁၇ ခုနှစ် အစောပိုင်းကာလတွင် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ တွင်းတူး ဆောင်ရွက်မည့် နေရာသည် အနီးဆုံးကမ်းခြေမှ အနည်းဆုံး (၂၁) မိုင် အကွာတွင် တည်ရှိပါသည်။

မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဥပဒေ၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းနည်းဥပဒေများအရ အဆိုပြုလုပ်ဆန်းစဉ်အတွက် Woodside မှ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အား ဆောင်ရွက်ရန် လိုအပ်မည်ဖြစ်ပါသည်။

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်းများ (၂၀၁၅)အရ Woodside မှ စီမံကိန်းဆိုင်ရာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအား Environmental Resources and Management (ERM) နှင့် E Guard Environmental Services (E Guard) တို့မှ တာဝန်ယူ ဆောင်ရွက်လျက်ရှိပါသည်။

ဒေသဆိုင်ရာအများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းအား အမျိုးသားအဆင့်နှင့် ဒေသဆိုင်ရာအဆင့်အဖြစ် ရန်ကုန်၊ နေပြည်တော်နှင့် ဧရာဝတီတိုင်းဒေသကြီးတို့တွင် ဆောင်ရွက်ခဲ့ပြီး ဖြစ်ပါသည်။

အဆိုပြု လုပ်ငန်းစဉ်ဆိုင်ရာ သတင်းအချက်အလက်များနှင့် Woodside ၏ မြန်မာနိုင်ငံတွင် ဆောင်ရွက်လျက်ရှိသည့် လုပ်ငန်းစဉ်များအား သိရှိလိုပါက Woodside ၏ အင်တာနက် ပင်တိုဆိုင် woodside.com.au/myanmar-consultation တွင်ရှာဖွေတော်ရှုနိုင်ပါသည်။ အကြံပြု သုံးသပ်ချက်များနှင့် မေးမြန်းလိုသည်များရှိပါက feedback@woodside.com.au နှင့် info@eguardservices.com သို့ (၂၁-၁၀-၂၀၁၆) ရက်နေ့ မနောက်ဆုံး ထားရှိ စာဖရေးသား ပေးပို့နိုင်ပါသည်။

Translation: Woodside Energy (Myanmar) Pte Ltd (Woodside) proposes to undertake a drilling program in Block A-6, located offshore Ayeyarwady Region, Myanmar. This is scheduled to commence in early 2017 using a dynamically positioned Mobile Offshore Drilling Unit. The area in which the wells will be drilled in located at least 21 miles from the nearest coastline.

Under the Environmental Conservation Law and Environmental Conservation Rules of the Republic of the Union of Myanmar, Woodside was required to undertake an Environmental Impact Assessment (EIA) for the proposed activity. The EIA is being conducted by Environmental Resources Management (ERM) and E Guard Environmental Services (E Guard), on behalf of Woodside, in accordance with the Myanmar EIA Procedure (2015). Associated stakeholder engagement has been undertaken at the national and local levels in Yangon, Naypyidaw and Ayeyarwady Region.

More information about the proposed activity and Woodside's operations in Myanmar can be found on Woodside's webpage woodside.com.au/myanmar-consultation. Any queries, comments or suggestions on the Project on the report can be provided in writing to feedback@woodside.com.au, info@eguardservices.com by 21 October 2016.

Figure 8.3 Advert Text

Figure 8.4 Advert in National Paper (The Mirror)

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

The EIA Study for the proposed drilling in A-6 was conducted in line with the EIA Procedure.

The EIA demonstrates that the JV understands the environment and social setting in which it is operating and has properly assessed the key potential environmental and social impacts associated with the Project. A project-specific, dedicated EMP has been developed to manage impacts associated with the Project and ensure legislative compliance and standards of good practice. Provided that the recommended mitigation measures are properly implemented, it is expected that the environmental and social impacts of the proposed drilling in A-6 would be managed by the JV in an acceptable manner.

From a social perspective, given that the Project Area is located about 21 miles (35 km) from the mainland coastline, it was concluded that the Project is not likely to have an impact on local communities in Ayeyarwady Region. The Project has no significant onshore activities. Crew changes may be undertaken in Yangon, Singapore or Thailand; although this is still to be confirmed. However, it is unlikely to be any adverse impact on the local communities or livelihoods. For environmental impacts, the Project is located about 21 miles (35 km) from the mainland coast and distant from any protected areas or sensitive habitats. The seabed where the drilling will be located is unlikely to be sensitive with respect to seabed habitats and associated communities and potential impact is expected to be small scale and temporary in nature. The generation of underwater sound will be limited to operational activities of the vessels and drilling and a very short duration VSP (about ten hours of source release within a 24 hour period per well). Drill stem testing may be carried out on one or two wells, and the associated intermittent flaring is expected to be approximately 20 days in total. The total flared volume of gas is expected to be between approximately 600 to 900 MMscf. The actual volume and duration of well testing are both subject to the outcomes of drilling, and will be minimised to the extent possible.

The EIA concludes that **no Major** impacts are anticipated from this Project and all impacts have been properly mitigated to be ALARP [108].

9.2 RECOMMENDATIONS

An EMP has been prepared which details the required mitigation measures and all reporting and monitoring requirements. Woodside will have a Drilling representative on board the MODU to monitor the contractors' activities and ensure compliance with the stated mitigation measures.

Woodside will disclose the EIA Report in local newspapers and on their website and copies will be distributed to public meeting places and at the Woodside office in Yangon. The executive summary of the EIA Report will be translated into the local language and distributed in Pathein, Shwe Thaung Yan and Chaungthar. Information regarding the ongoing activities will be provided to fishing organisations (DoF, MFF) in order to distribute information. This will be an ongoing process throughout the life cycle of the Project.

(108) As Low As Reasonably Practicable (ALARP) has been defined as an impact that is tolerable only if impact reduction is impracticable or if the effort involved in reducing the impact further would be grossly disproportionate to the benefit gained.

Annex 2.1 CVs for the Environmental and Social Experts

Craig A Reid

Partner

Craig A. Reid is a Partner with Environmental Resources Management (ERM) and Manager of the Hong Kong based ESHIA Management, Marine Sciences and Water Group.

With over 18 years' experience Mr Reid is responsible for providing technical services to ERM's clients worldwide to help manage environmental risks and challenges. Mr Reid has specific experience in servicing ERM's key industry sectors, namely Oil and Gas, Power and Mining as well as a strong background in Government regulatory and management services.

Mr Reid has worked extensively in Myanmar for almost 10 years, primarily supporting private investment receive Government Approvals to construct and operate. Recently these projects have included helping a significant number of the new international operator's fulfill their EIA, SIA and EMP obligations as part of newly awarded onshore and offshore exploration permits, as well as supporting investment in power generation projects including both coal and gas fired units. Mr Reid has also supported investment agencies including the IFC and USAID in helping provide economic development and capacity building within the Myanmar Government and private sector. Clients Mr Reid has worked for in Myanmar include IFC, Total, PTTEP, BG, Petronas Carigali, eni, Daewoo, CNPC, MPRL, Statoil, ROC Oil, Hyundai, Toyo Thai and GMS Power.

Through these studies Mr Reid has gained an excellent understanding of the Myanmar environment, as well as strong relationships with local consultancies, academics and Governmental Departments such as the Ministry of Environment, Conservation and Forestry (MOECAF), the Myanma Oil and Gas Enterprise (MOGE) and the Ministry of Energy (MOE).

In addition to the above, Mr Reid has worked on projects related oil and gas infrastructure, seismic survey, exploratory and production drilling, decommissiong, dredging, disposal and reclamation, mud disposal facilities, port management, onshore and offshore power generation, offshore wind farms, sewage infrastructure, sewage treatment plants, sewerage schemes, incinerators, fuel storage facilities, theme parks, highways, railways, submarine cables and overhead power lines. The results of these studies have been used to present information on baseline conditions of sensitive habitats and biodiversity, to assess acceptability of installations, developments or facilities, or to develop and implement mitigation, management and marine conservation programmes.

Through these projects Mr Reid has gained a balance of experiences from the perspective of the proponent as well as that of the contractor and consultant. Mr Reid has been able to bring those skills to ensure projects gain regulatory approval or achieve the desired outcome be it from an environmental, engineering or cost perspective.

Based in Hong Kong, Mr Reid has worked extensively internationally, having undertaken studies in Africa (Angola, Benin, Egypt, Gabon, Ghana, Liberia, Nigeria, Sierra Leone and Togo), Middle East (Abu Dhabi, Iran, Bahrain, Qatar and Saudi Arabia) South East Asia (Singapore, Thailand, Philippines, Malaysia, Vietnam, Brunei and Myanmar) East Asia (China, Hong Kong, Japan and South Korea) and the Pacific Rim (Australia, New Zealand and Fiji).

EDUCATION

- BSc (Hons), Marine Biology, University of Stirling, Scotland, United Kingdom, 1997

Professional Affiliations & Registrations

- Member of the International Association for Impact Assessment
- Member of the Society of Petroleum Engineers
- Member of the Marine Biological Association of Hong Kong
- Member of the Hong Kong Institute for Environmental Impact Assessment

ERM

PROJECTS IN MYANMAR

- ESIA for Seismic Exploration of Offshore Blocks A-04 and AD-02, Myanmar, for BG, 2014. *Partner-in-Charge.*
- ESIA for Seismic Exploration of Offshore Block AD-10, Myanmar, for Statoil, 2014. *Partner-in-Charge.*
- ESIA for Onshore Seismic Exploration of Block IOR-4 and Block IOR-6, Myanmar, for MPRL E&P, 2014. *Partner-in-Charge.*
- EIA for Enhanced Oil Recovery of the Mann Oil Field, Myanmar, for MPRL E&P, 2014. *Partner-in-Charge.*
- ESIA for Onshore Seismic Exploration of Block C-1 and Block H, Myanmar, for Pacific Hunt Energy Corp, 2014. *Partner-in-Charge*
- ESIA for Exploration of onshore Block MOGE-4, Myanmar, for COAG s.a.r.l, 2014. *Partner-in-Charge*
- ESIA for Exploration of offshore Block M-8, Myanmar, for Berlanga Holdings Ltd, 2014. *Partner-in-Charge*
- EIA / SIA for Exploration of Blocks PSC-K and RSF-5, for eni, 2014. *Technical Advisor.*
- Environmental and Social Consulting Services in Support of Transaction Advisory Services for the Mingyan IPP Project, for the IFC, 2014. *Project Director.*
- ESIA for Combined Cycle Power Plant, for GMS Power, 2014. *Technical Advisor.*
- ESIA for Exploration of Blocks AD6 and AD8, Chinnery Assets Limited (CNPC), 2013. *Project Director.*
- Environmental Risk Assessment for Offshore Exploration, for BG, 2013. *Technical Advisor.*
- Myanmar HSE Regulatory Framework Study, for RocOil, 2013. *Project Director.*
- Air Dispersion Modelling for Shwe Gas Development, for Daewoo International Corporation (Myanmar E&P), 2013. *Project Director.*
- EIA for the Shwe Gas Field Shore Base for Shwe Gas Field Development, for Daewoo International Corporation (Myanmar E&P), 2010. *Project Manager.*
- EIA for the Midstream Pipeline and Gas Metering Station for Shwe Gas Field Development, for Daewoo International Corporation (Myanmar E&P), 2009. *Project Manager.*
- Terrestrial Environmental Baseline Study for Onshore Midstream Facilities and Pipeline Landing Site, for Daewoo International Corporation (Myanmar E&P), 2008. *Project Manager.*
- Marine Environmental Baseline Survey for Midstream Pipeline, for Daewoo International Corporation (Myanmar E&P), 2008. *Project Manager.*
- Impact Identification Study for the Alternative Midstream Pipelines and Associated Onshore Facilities, for Daewoo International Corporation (Myanmar E&P), 2008. *Project Manager.*
- Drill Cuttings Modelling Study for Offshore Production Platform, for Daewoo International Corporation (Myanmar E&P), 2007. *Project Manager.*
- Environmental Impact Assessment for Upstream Facilities in Offshore Myanmar, for Daewoo International Corporation (Myanmar E&P), 2007. *Project Manager.*
- Marine Environmental Baseline Survey for the Development of Upstream Facilities in Offshore Myanmar, for Daewoo International Corporation (Myanmar E&P), 2006. *Project Manager.*
- Impact Identification Study for the Development of Upstream Facilities in Offshore Myanmar, for Daewoo International Corporation (Myanmar E&P), 2005. *Project Manager.*
- EIA for a Medium Compression Platform, Myanmar (Hyundai Heavy Industries & Total E&P Myanmar), 2007. *Project Manager.*
- Preliminary Environmental and Social Scoping Study for the Development of an Offshore Gas Field, for Daewoo International Corporation (Myanmar E&P), 2004. *Project Manager.*

POWER SECTOR PROJECTS

- Seawater Recirculation Study for Jeddah South Power Plant Stage I, HHI, Saudi Arabia, 2012. *Partner in Charge.*
- Marine Biodiversity Study for Shoaiba Power Plant Stage III, HSBC, Saudi Arabia, 2012. *Marine Expert.*
- EM&A Team for Installation of Offshore Wind Farm in Southwest Lamma Waters, Hong Kong, for The Hongkong Electric Co., Ltd., 2011 – ongoing. *Project Director.*
- Investigation into Fish Ingress at Hong Kong Electric Power Station, Lamma Island, Hong Kong, 2010 – 2011. *Project Manager.*
- ESHIA Update for Mong Duong 2 Power Plant, Vietnam, AES, 2010 – 2011. *Marine Ecology Specialist.*
- Cooling Mist Dispersion Study at Sabyia Combined Cycle Gas Turbine Power Station, Kuwait, HHI, 2009 – 2010. *Project Manager.*
- EIA for an Offshore Wind Farm Development in Hong Kong, for The Hongkong Electric Co Ltd, 2007 - 2009. *Project Manager.*
- Environmental, Health and Safety Impact Assessment (ESHIA) for Vung Ang II Thermal Power, for One Energy, Vietnam. 2008 - 2010. *Marine Ecology Specialist.*
- Environmental Impact Assessment of the Development of a 2,750MW Power Station and Desalination Plant in Jubail Industrial City, Marafiq IWPP, Kingdom of Saudi Arabia, for WSP Environmental Middle East, 2007. *Marine Ecology Specialist.*
- Seawater Recirculation Study, Al Dur IWPP, for Hyundai Heavy Industries Co. Ltd, Bahrain, 2008.

Project Manager.

- Seawater Recirculation Study, Marafiq IWPP, Hyundai Heavy Industries Co. Ltd., Kingdom of Saudi Arabia, 2006 – 2007. *Project Manager.*
- Baseline Water Quality Survey, Marafiq IWPP, Hyundai Heavy Industries Co. Ltd., 2006, Kingdom of Saudi Arabia. *Project Manager.*
- Thermal Plume Dispersion Study, Ma'aden Phosphate Company, Kingdom of Saudi Arabia, 2009. *Project Manager.*
- Kwang Yang Combined Cycle Power Plant Cooling Water Review, BP, South Korea, 2005.
- Emissions Control Project at the Castle Peak Power Station "B" Units, CAPCO, Hong Kong, 2006. *Marine Ecology Specialist.*
- Cooling Water Culvert Improvement Works, CLP Power, Hong Kong, 2002. *Marine Ecology Specialist.*
- EIA for an 1800 MW Gas-Fired Power Station at Lamma Extension, The Hongkong Electric Co., Ltd., Hong Kong, 1998 – 1999. *Marine Ecology Specialist.*
- Identification of Constraints to the Routing of HEC New Gas Pipeline - Desktop Study, The Hongkong Electric Co., Ltd., 1998. *Project Manager.*

OIL AND GAS PROJECTS

MARINE SEISMIC SURVEY (2-D, 3-D AND 4-D)

- Screening and Scoping Study for 3D Seismic Survey of three Blocks in the South China Sea, Shell, 2012. *Partner in Charge.*
- Environmental Scoping and Management Plan for 3D Seismic Survey of Blocks 64/18 and 53/30 in the South China Sea, China, Chevron, 2010. *Project Manager.*
- Environmental Risk Assessment of a 3D Marine Seismic Survey in Southern Chinese Waters, BG, 2008. *Marine Ecology Specialist.*
- Survey on Environmental Impact of Marine Seismic Operations, Japanese Oil, Gas and Metals Corp, 2008 - 2009. *Project Manager.*
- ESHIA for Block G4/50 Seismic Survey, Gulf of Thailand, Chevron, 2008 - 2009. *Marine Ecology Specialist.*
- Monitoring Impacts of 3D Marine Seismic Surveys for Browse Field Development, Woodside Energy Limited, Australia, 2007 – 2009. *Lead Scientist.*
- Environmental Review for 2D Marine Seismic Survey in Southern Chinese Waters, BG, 2007. *Project Manager.*
- Environmental Protection Statement for Maxima 3D Marine Seismic Survey at Scott Reef, Woodside Energy Limited, 2007. *Lead Scientist.*
- Marine Seismic Survey Integrated Impact Assessments, Offshore Brunei Darussalam, Brunei Shell Petroleum Sdn Bhd, 2004 – 2006. *Lead Scientist.*

EXPLORATORY/PRODUCTION OPERATIONS

- ESHIA for Seismic Exploration of Blocks 15/10 & 15/27 in South China Sea, Chevron, 2013. *Project Director.*
- ESHIA for Exploration Drilling of Block 42/05 in South China Sea, Chevron, 2013. *Project Director.*
- ESIA for Exploration Drilling of a Deepwater Well in the Sea of Japan, JX Nippon Oil, Japan, 2012. *ESIA Advisor.*
- ESHIA for Exploration Drilling of Block 64/11, 53/30 and 42/05 in South China Sea, Chevron, 2011. *Project Director.*
- ESHIA for Block B Gas Development, Vietnam, for Chevron Vietnam, 2010. *Lead Marine Scientist.*
- ESHIA for Pandora Offshore Gas Development, Talisman, Papua New Guinea, 2010 ongoing. *Lead Marine Scientist.*
- ESHIA for Shore Base for Offshore Operations, Thailand, for Chevron Pattani Thailand, 2008 – 2009. *Project Manager.*
- ESHIA for Block G4/48(c) Production Facility, Gulf of Thailand, Chevron, 2007 – 2008. *Lead Marine Scientist.*
- Status and Trends of HSE Issues in the Oil and Gas Industry, Japanese Oil, Gas and Metals Corp, 2007, 2008 and 2010. *Key Presenter.*
- Impact Assessment of Mampak Block 4 Field Development, Brunei Shell Petroleum Sdn Bhd, 2006 – 2009. *Lead Marine Scientist.*
- Main Oil Line Replacement Study, Brunei Shell Petroleum Sdn Bhd, 2007 – 2008. *Lead Marine Scientist.*
- Impact Assessment of Bugan Field Development, Brunei Shell Petroleum Sdn Bhd, 2006 – 2009. *Lead Marine Scientist.*
- Pipeline Replacement Project, Brunei Shell Petroleum Sdn Bhd, 2007. *Lead Marine Scientist.*
- Impact Assessment of Seria North Flank Development, Brunei Shell Petroleum Sdn Bhd, 2006 – 2007. *Lead Marine Scientist.*
- Bugan Phase II ROV Field Survey, Brunei Shell Petroleum Sdn Bhd, 2006. *Lead Marine Scientist.*
- Integrated Impact Assessment of the Jetty Relocation Project, Brunei Shell Petroleum Sdn Bhd, 2004. *Lead Marine Scientist.*

DRILL CUTTINGS AND PRODUCED WATER DISPOSAL

- Drill Cuttings Study for Block D12 in Offshore Sarawak, for Shell Sarawak Berhard, Malaysia, 2012. *Project Director.*
- Drill Cuttings Modelling for Well SH-05 in Abu Dhabi, for Wintershall, Abu Dhabi, UAE, 2011. *Technical Lead.*

- Drill Cuttings and Oil Spill Modelling for Hair Dalma HD-09 Well in Abu Dhabi, for ADMA-OPCO, Abu Dhabi, UAE, 2011. *Project Manager.*
- Drill Cuttings and Oil Spill Modelling for Block 64/11, 53/30 and 42/05 in South China Sea, Chevron, 2011. *Project Director.*
- Drill Cuttings Modelling Study Bugan Field Development (Brunei Shell Petroleum Sdn Bhd), Brunei, 2008. *Project Manager.*
- Drill Cuttings Modelling Study Bubut Field Development (Brunei Shell Petroleum Sdn Bhd), Brunei, 2007. *Project Manager.*
- Peragam Exploration Well Drill Cuttings Modelling, Brunei Shell Petroleum Sdn Bhd, 2006 – 2007. *Project Manager.*
- BSP CP127ST1 Well CPDP-12, Champion South-East Development Project, for Brunei Shell Petroleum Sdn Bhd, Brunei, 2007. *Project Manager.*
- Oil Spill Modelling Study for Offshore Production Platform, TOTAL, 2007 – 2008. *Project Manager.*
- Oil Spill Modelling Study for Offshore Production Platform, Shell Australia, 2007 – 2008. *Project Manager.*

FLOATING PRODUCTION STORAGE AND OFFLOADING (FPSO) VESSELS

- Fishing/Fisheries Scoping/Baseline Study for Offshore Developments, Ghana, for Tullow Ghana Ltd, 2010 - ongoing. *Technical Specialist.*
- Integrated Impact Assessment of the Development of Cendor Field, Petrofac, 2005 – 2006. *Lead Marine Scientist.*

LNG TERMINALS (EXPORT AND RECEIVING)

- Environmental Social Health Impact Assessment for a Floating Liquefied Natural Gas Facility in Offshore Waters, Northwest Australia, Confidential, 2008 – 2009. *Marine Ecology Specialist.*
- Manzanillo LNG Terminal, Korea, Samsung Engineering Company Ltd (SECL), 2008. *Lead Marine Scientist.*
- Environmental Impact Assessment (EIA) of Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities, CAPCO, 2005 – 2007. *Project Coordinator.*
- Adequacy Review of Environmental Assessment for Proposed Taranaki LNG (New Plymouth Council), 2008. *Lead Marine Scientist.*
- Environmental and Risk Assessments for two Natural Gas Facilities in Southeast Asia, CAPCO, 2004 – 2005. *Project Coordinator.*
- Detailed EIA and FEED Study for Submarine Gas Pipelines from Shenzhen LNG Terminal to Tai Po Gas Production Plant, Hong Kong & China Gas Company, 2002 – 2003. *Lead Marine Scientist.*
- Study of Potential Land-based Sites for Natural Gas Facilities in Southeast Asia, CAPCO, 2002 – 2003. *Project Coordinator.*
- Site Selection and Scoping Study for an LNG Terminal in Thailand, Confidential Client, 2005 – 2006. *Lead Marine Scientist.*

DECOMMISSIONING

- Options Assessment Update for Lufeng 22-1 Oil Field Decommissioning Project, Statoil, 2008–2009. *Project Manager.*
- Options Assessment for Lufeng 22-1 Oil Field Decommissioning Project, Statoil, 2004. *Lead Marine Scientist.*
- Platforms Decommissioning Campaign, Offshore Brunei Darussalam, Brunei Shell Petroleum Sdn Bhd, 2004. *Lead Marine Scientist.*
- Environmental Impact Study of Temsah NW Platform Disposal, Eni E&P, 2005. *Lead Marine Scientist.*
- Consultation on Decommissioning of Overseas Offshore Platforms, CNOOC, 2006. *Project Manager.*

DOWNSTREAM PROJECTS

- ESHIA for a Greenfield Refinery in Mandji Free Trade Zone, Samsung C&T, Gabon, 2012. *Project Director.*

PORT RELATED PROJECTS

- ESIA of a Greenfield Port, APM Terminals, Nigeria, 2012. *Project Director.*
- Contaminated Sediment Disposal Facility at South of Brothers – EIA Update, Civil Engineering and Development Department, Hong Kong Government, Hong Kong, 2009 - 2010. *Project Manager.*
- EM&A for Contaminated Mud Pit IV at East of Sha Chau, CEDD, Hong Kong Government, 2009 – 2013. *Deputy Environmental Team Leader.*
- EM&A for Contaminated Mud Pit IV at East of Sha Chau, CEDD, Hong Kong Government, 2005 – 2009. *Deputy Project Manager.*
- EM&A for Contaminated Mud Pit IV at East of Sha Chau, CEDD, Hong Kong Government, 1997 – 2002. *Project Coordinator.*
- Ecological Monitoring for Uncontaminated Mud Disposal, CEDD, Hong Kong Government, 1999 – 2002. *Project Manager.*
- Review of the Contaminated Mud Disposal Strategy and the need for an Intermediate Contaminated Mud Disposal Facility, CEDD, Hong Kong Government, 2002 – 2003. *Project Manager*

- Ecological, Fisheries and Water Quality Impact Assessment Study for the Proposed Port Development at Northwest Lantau, EDLB, Hong Kong Government, 2005 – 2007. *Water Quality Specialist.*
- Environmental Impact Assessment of Savusavu Port, Rural and Outer Islands Project, Asian Development Bank, Fiji, 2006 – 2007. *Environmental Team Lead.*
- EIA of the Development of a Container Terminal, Vietnam, SPCT/P&O Ports, Vietnam, 2006 – 2008. *Lead Marine Scientist.*
- Permanent Aviation Fuel Facility, Leighton Contractors Asia Limited, Hong Kong, 2003 – 2009. *Environmental Team Leader.*
- Strategic Assessment and Site Selection Study for Contaminated Mud Disposal, CEDD, Hong Kong Government, 1999. *Marine Ecology Specialist.*
- Site Specific Feasibility of Sludge Management Strategy and Sludge Disposal Plan, EPD, Hong Kong Government, 1998 – 2000. *Marine Ecology Specialist.*
- Focussed Cumulative Water Quality Impact Assessment for the West Po Toi Sand Borrow Area, HAM Dredging & Marine Contractors, 2001. *Marine Ecology Specialist.*
- Baseline Survey at East Tung Lung Chau, CEDD, Hong Kong Government, 1999. Non-Statutory Marine Environmental Monitoring Update, Airport Authority Hong Kong, 2002 – 2003. *Marine Ecology Specialist.*
- Performance Verification of Stanley and Shek O Outfalls, EPD, Hong Kong Government, 1999 – 2001. *Marine Ecology Specialist.*
- Sustainable Development for the 21st Century, Supplementary Agreement for Undertaking Baseline Surveys - Monitoring of Toxics in Marine Sediment and Biota, PlanD, Hong Kong, 2000. *Marine Ecology Specialist.*

MINING PROJECTS

- Marampa Mine ESHIA, London Mining PLC, Sierra Leone, 2012. *Aquatic Specialist*
- ESHIA of Weda Bay Nickel Mine, ERAMET, Indonesia, 2011. *Marine Specialist.*

TRANSPORT

- EIA Review Consultancy for Hong Kong Airport Third Runway Project, Airport Authority Hong Kong, Hong Kong, 2012-2013. *Project Manager*
- EIA Review for Area 54 Road Network, Transport Department, Hong Kong, 2012-2013. *Project Director.*

SEWAGE INFRASTRUCTURE AND DRAINAGE

- Agreement No. CE 55/2009 (DS) - Outlying Islands Sewerage Stage 2 – South Lantau Sewerage Works – Investigation EIA, Hong Kong, for DSD, 2010 – 2014. *EIA Manager.*
- Agreement No. CE 6/2002 (DS) - Drainage Improvement in Northern New Territories – Package C - Investigation, Design and Construction – EIA for TKL05, Hong Kong, for DSD, 2010 – 2012. *EIA Manager.*
- Agreement No. CE 6/2010 (DS) - Improvement of Yuen Long Town Nullah (Town Centre Section) – Investigation EIA, Hong Kong, for DSD, 2010 – 2012. *EIA Manager.*
- Environmental Impact Assessment of Regulation of Shenzhen River Stage IV EIA Study, Hong Kong, for DSD, 2009 – 2011. *Water Quality Specialist.*
- Hong Kong Sewage Harbour Area Treatment Scheme (HATS) Stage 2 – Supplementary Water Quality Monitoring, EPD, Hong Kong Government, Hong Kong, 2007 – 2011. *Project Manager.*

NATURAL RESOURCE MANAGEMENT

- Total Water Management for Hong Kong – Feasibility Study, DSD, Hong Kong Government, 2005 – 2008. *Project Manager (Environmental).*
- Study in Terrestrial Habitat Mapping Based on Conservation Value, SDU, Hong Kong Government, 2002 – 2003. *Project Manager.*
- Artificial Reef Deployment Study, AFCD, Hong Kong Government, 1998 – 1999. *Marine Ecology Specialist.*
- Fisheries Resources and Fishing Operations in Hong Kong Waters, AFCD, Hong Kong Government, 1998. *Marine Ecology Specialist.*
- Seabed Ecology Studies, AFCD, Hong Kong Government, 1998 – 1999. *Marine Ecology Specialist.*

ROUTE SELECTION AND ENVIRONMENTAL PERMITTING

- FLAG North Asian Loop, International Submarine Cable System, Hong Kong to Taiwan, (FLAG Telecom), Hong Kong, 2001 - 2002. *Marine Ecology Specialist*
- New T&T Hong Kong Limited, Domestic Cable System (New T&T), Hong Kong, 2000 - 2001. *Marine Ecology Specialist*
- C2C International Submarine Cable System – Hong Kong Section (SingTel and GB21), Hong Kong, 2000 – 2001. *Marine Ecology Specialist*
- East Asian Crossing (EAC1) International Submarine Cable System (Asia Global Crossing and KDD SCS), Hong Kong, 2001. *Marine Ecology Specialist*

- East Asian Crossing (EAC2) International Submarine Cable System (Global Crossing Development Co. and NEC Networks), Hong Kong, 2001. *Marine Ecology Specialist*
- Telecommunications Installation at Lot 591SA in DD 328, Tong Fuk, South Lantau Coast and Associated Cable Landing Work in Tong Fuk, South Lantau for the North Asia Cable (NAC) Fibre Optic Submarine Cable System (Level(3)), Hong Kong, 2000. *Marine Ecology Specialist*
- 132kV Submarine Cable Installation for Wong Chuk Hang – Chung Hom Kok 132kV Circuits (The Hongkong Electric Co. Ltd), Hong Kong, 2001 - 2002. *Marine Ecology Specialist*
- 132kV Submarine Cable Circuits from A Kung Wan to Sai Kung Pier (CLP Power), Hong Kong, 1999. *Marine Ecology Specialist*
- Seabed Survey Work for the Proposed 11kV Cable Circuits from Tai Mong Tsai to Kiu Tsui (CLP Power), Hong Kong, 1999. *Marine Ecology Specialist*
- Seabed Survey Work for the Proposed 11kV Cable Circuit between Pak Lap and Fu Tau Fan Chau (CLP Power), Hong Kong, 1999. *Marine Ecology Specialist*

SELECTED PUBLICATIONS

- Grebe, C.C, Smith, L. & **Reid, C.A** (2009) The Effects of Marine Seismic Acquisition in a Coral Reef Environment: Results from a Multi-Disciplinary Monitoring Program at Scott Reef, Western Australia. APPEA Conference 2009.
- Grebe CC, Smith L, **Reid CA**, Hearn RL and Colman JG (2008) *The Effects of Marine Seismic Acquisition in a Coral Reef Environment: A Synthesis of Results from a Multi-Disciplinary Monitoring Program at Scott Reef, Western Australia.* APPEA 08.
- Hastings M, **Reid CA,** Hearn R, Grebe C and Coleman J (2008) *The Effects of Seismic Airgun Noise on the Hearing Sensitivity of Tropical Reef Fishes at Scott Reef, Western Australia.* Proceedings of the Institute of Acoustics, 2008.
- C.C. Grebe, J.G. Colman & **C.A. Reid** (2008) *Practical application of an adaptive management approach for a marine seismic survey*. IAIA08 Paper.
- Qui JW, **Reid CA**, Kennish R and Qian PY (2003) *Recolonisation of Benthic Infauna Subsequent to Capping of Contaminated Mud Pits with Uncontaminated Sediments in East Sha Chau, Hong Kong.* Estuarine and Coastal Shelf Science 56 (2003) 819-831.
- Germano JG, **Reid CA**, Whiteside P and Kennish R *(2002) Field Verification of Computer Models Predicting Plume Dispersion in Hong Kong*. Dredging 02 - Proceedings of American Society of Engineers.
- Kennish R, Lui PH, Chan A, Allery SC, Leung KF and **Reid CA** (2002) *Sewage Outfall Performance Verification in Hong Kong: The results of an integrated modeling and monitoring approach.* Proceedings of the International Conference Wastewater Management & Technologies for Highly Urbanized Coastal Cities 2002, pp 295-301.
- Nicholson S, Clarke SC, Word JQ, Kennish R, Barlow KL & **Reid CA** (2000) *Quality Assurance in the Toxicological Assessment of Hong Kong Dredged Sediments: The Potential Influence of Confounding Factors on Bioassay Results.* ISWA Conference Proceedings, October 2000, Hong Kong

CONTACT DETAILS

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16th Floor, Berkshire House,
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Jon Perry

Partner – Oil & Gas
Impact Assessment and Planning

Jon is a Partner in ERM based in Perth, Western Australia. He has over twenty years' experience of providing environmental consultancy services to industry, primarily within the oil and gas sector. Jon is an experienced EIA practitioner and accredited Environmental Auditor. His experience within the exploration and production industry goes back to 1990 and since that time has included work both onshore and offshore across a wide range of geographies.

Jon possesses considerable expertise in providing environmental support at all stages of oil and gas development, from seismic and drilling impact assessment to establishing and auditing environmental management systems and plans, through to support for the operational management of pipelines and production assets. He has worked for clients ranging in size from small independents through to supermajors, as well as undertaking projects for national governments, industry bodies, project finance organisation and NGOs.

Jon has extensive experience of project management, co-ordinating assessment, audit and survey teams, liaison with clients, contractors, stakeholders and authorities, project development and scheduling, budget control and performance monitoring. He has worked with International Financial Institutions both in compiling international standard assessments and providing due diligence services to lender organisations.

Overseas experience and International project management includes work in the following countries: Albania, Algeria, Austria, Australia, Azerbaijan, Bulgaria, Cameroon, Chile, Ethiopia, The Falkland Islands, Georgia, Greenland, Libya, New Zealand, Norway, Qatar, Romania, Russia, Tanzania, Tunisia, Turkey, Uganda, Yemen.

Professional Affiliations & Registrations

- Registered Environmental Auditor (IEMA)
- Member of the Society of Petroleum Engineers (SPE)

Fields of Competence

- Oil and Gas Sector
- Impact Assessment
- Environmental Auditing and Due Diligence
- Environmental & Social Management Plans

Education

- MSc Environmental Impact Assessment, University of Wales Aberystwyth, UK, 1995.
- BSc Geology and Geophysics, Durham, UK, 1993.

Languages

- English, some French

Training & Awards

- Advanced EMS Auditor Training Course, UK
- HSE Management & Risk Assessment
- Basic Offshore Safety Induction and Emergency Training (BOSIET), UK *(to be renewed)*
- UKOOA Medical & ISOS Fitness to Work
- Ethics and ABC Training

Publications & Presentations

- Murdoch University (2015) MasterClass Lecture: Introduction to EIA.
- Oxford University (2014) MSc Programme Lecture: Environmental Impact and Strategic Assessment.
- SPE (2013); Attaining 'Privilege to operate' in the Arctic; Understanding the environmental, social and political risks in a rapidly evolving system.
- Perry J (1996); Failure of the UK Government to Implement EIA Legislation Offshore. Institute of Environmental Assessment Magazine.
- L. M. Murdoch, F. W. Musgrove and J. S. Perry (1995); Tertiary uplift and source rock maturity. Geological Society Special Publication volume 93.
- Perry J (1995); Environmental Impact of Offshore Oil and Gas Development. Project Appraisal magazine.

Key Projects

Impact Assessment Alignment and Guideline, Corporate, (Confidential Client) 2016.
Instigator, project lead and main author for a high profile project to better align the client's IA systems and processes with established international and industry standards. This required a solid understanding of international IA best practice, as well as of the client's systems, together with the ability to facilitate workshops to both educate key stakeholders and gain valuable input from the end-users.

Environmental Approvals for Offshore Drilling, Myanmar, (confidential client), 2015.
Technical reviewer and senior local contact for an Australian client operating in Myanmar. This project involved submissions encompassing both seismic and drilling activity, scoping, ENVID, stakeholder engagement, impact assessment and development of environmental and social management plans.

Due Diligence Support for Oil and Gas Asset Transaction, Western Australia (confidential client), 2015.
Senior involvement in the local project team undertaking extensive due diligence to support a major transaction. The work involved VDR reviews and materiality assessment on a range of assets.

Environmental Management Plans for Seismic and Production Operations, Timor Sea Joint Petroleum Development Area (JPDA) (ConocoPhillips), 2015. Partner in Charge
Project lead for development of EMPs encompassing a range of operations in the Timor Sea JPDA for ConocoPhillips. The work involved facilitating ENVIDS, managing the compilation of risk registers and management plans, agreeing mitigation and management practices and defining the appropriate standards for regulatory and corporate submissions.

Coastal Oil Spill Sensitivity Mapping, Great Australian Bight (confidential client), 2014-15. Partner in Charge
Project lead for a GIS based project to map coastal sensitivity to oil spills (environmental and socio-economic) across the extensive coastline of the Great Australian Bight. Work was undertaken according to client and international standards (NOOA / IPIECA).

2D Marine Seismic Survey EP (Searcher Seismic), 2014 – 2015. Partner in Charge
Project lead for compiling an Environment Plan in support of a large 2D seismic survey on the north-west shelf area offshore Western Australia. Work was undertaken according to NOPSEMA standards and current guidelines.

3D Marine Seismic Survey EP (Polarcus), 2014. Partner in Charge
Project lead for compiling an Environment Plan in support of a large 3D seismic survey on the north-west shelf area offshore Western Australia involving multiple seismic vessels. Work was undertaken according to NOPSEMA standards and guidelines.

Development of EHS Procedures for offshore production operations, Western Australia (confidential client), 2014 – 2015. Partner in Charge
Project lead for developing and delivery a range of EHS Procedures or a major oil and gas client in WA as it prepared for a major offshore production operation. The work involved close liaison with client stakeholders and a thorough understanding of internal procedures and Australian EHS requirements.

Site selection for early LNG development, East Africa (Statoil), 2012 – 2013. Partner in Charge
Project Director for an extensive (6 month+) site selection and early works programme for development of an LNG project in East Africa, including field visits, stakeholder engagement and multi-client workshops.
Integrated Impact Assessment (IA) to IFC standards, unconventional resource exploration, Central Europe (Shell), 2012-2013. Project Manager.
Manager of a major IA for a multinational looking to develop unconventional resources in Central Europe, including extensive scoping and baseline studies, long-term monitoring, development of innovative reporting techniques and stakeholder engagement methods, specific waste and water studies and a comprehensive programme of management and mitigation measures.

Provision of Lender Due Diligence Consultancy Services for Nabucco onshore pipeline (Europe), 2010-2012. Project Manager.
Acting as the Lender's Independent Environment and Social Consultants to apply consistency across delivery of 5 ESIAs by in-country consultancies. The role involved regular meetings with the client and Lender Group (EIB, IFC, EBRD), review of ESIAs and associated documents and development of review protocols to ensure consistency in delivery across the five countries.

ESIA for offshore drilling operations, Gabon, Confidential Client, 2012.
Project Director for an ESIA in collaboration with local partners in Gabon for a planned offshore drilling

programme off west Africa. This included a kick-off workshop with the client project team and followed on from successful submission of the previous seismic ESIA to this client in the same area.

EIA for 3D Seismic Survey Offshore West Greenland, Petroleum Geo-Services, 2011.
Project Director of an EIA for a 3D seismic survey in the Disko West area of offshore Greenland, undertaken in collaboration with local Greenlandic partners.

ESIA for Drilling and Hydraulic Fracturing, Algeria, Confidential Client, 2011.
Project Manager for an ESIA covering onshore drilling and hydraulic fracturing operations in Algeria for a major client. The scope of work involved detailed scoping workshop to define the key aspects and sensitivities, ongoing liaison with client technical teams and consideration of a broad range of issues connected to fraccing, including water use, stakeholder perception, lack of relevant regulations etc.

ESIA and ESMPs for Field Development and Gas Processing Activities, Kurdistan Region of Iraq, Confidential Client, 2008-2011.
Early screening and scoping exercise followed by development of an ESIA referencing International standards for a complex field development in northern Iraq. Due to the timing of the project, there was a strong focus on developing and implementing environmental and social management and monitoring plans to ensure potential impacts are managed in an effective way going forwards.

Full EIA and SIA for offshore exploration drilling, West Greenland for Cairn Energy 2009-2011.
Project Manager for EIA and SIA studies for a dual-rig, multi-well campaign offshore Greenland in a highly sensitive and operationally challenging environment. The project involved stakeholder consultations, public hearings, oil spill and cutting dispersion modelling and incorporation of comprehensive marine environmental survey data into the assessments.

ESIA for onshore drilling programme, western Libya. BP, 2010. Project Manager
This assessment involved managing and participating in a large onshore field survey involving both the client and the Libyan authorities, as well as in-country consultations and presentations. Accompanying the ESIA was a Best Practicable Environmental Option (BPEO) Study into drilling waste management.

High level socio-economic and environmental screening study for proposed field acquisition, 2009. Middle East, client confidential. Principal Consultant.
Desktop study and client workshops to examine the likely socio-economic and environmental risks associated with a potential field acquisition. Follow-up work involved quantifying potential schedule and cash-flow implications of the identified risks.

ESIA for onshore seismic, western Libya. BP, 2009. Project Manager
Full environmental and social impact assessment in advance of seismic operations in the Ghadames area. The project included an examination of the issues connected with the World Heritage Site and a stakeholder engagement visit to Ghadames. Extensive satellite image analysis was carried out for the baseline, reinforced by field surveys with local experts.

Offshore drilling ESIA, West of Ireland, ENI, 2008. Project Manager
Jon managed the provision of comprehensive environmental support for a two well drilling campaign in Irish waters including environmental survey scope, baseline study, register of legal requirements, chemical permitting support and production of ESIAs. Consultation and client meetings were held in the UK and Ireland throughout the 12 month assessment.

Field Development ESHIA, Onshore Algeria, FCP, 2006-2008. Project Manager
Manager of an ESHIA aligned to IFC standards for operations including drilling, processing and pipelines in eastern Algeria. The extensive project involved social and health assessments, air dispersion modelling, review of FEED documentation and preparation of a full ESHIA and ESMPs. Jon provided hands-on project management, supervision of field teams and baseline surveys, client liaison and document review/QC.

Environmental Statement, offshore Europe, Wavefield Inseis, 2007. Lead Auditor
Development of an Environmental Statement for a seismic vessel, including one week offshore undertaking a vessel and operations audit. The project also involved a review of all applicable legislation and audit standards and development of a bespoke audit protocol.

Becky Summons

Senior Consultant

Becky Summons is a Senior Consultant with ERM based in the Yangon, Myanmar Office. Miss Summons specializes in Environmental and Social Impact Assessments and has worked on a number of projects in the oil and gas, renewables, infrastructure, power and marine cable industries. She has particular experience in undertaking environmental and social impact assessment to lender requirements (such as IFC, EBRD, Equator Principles and JBIC).

Becky has been working exclusively in Myanmar for nearly two years on projects for Ophir, Woodside, BG Group, Berlanga, CAOG, and Statoil related to offshore and onshore exploration activities. She is also involved in a number of construction and infrastructure projects.

She has taken part in numerous public consultations for ESIA studies in throughout Myanmar at the union to the village level and has built up good relationships with governing bodies such as MONREC and MOEE. Becky has also lead stakeholder engagement activities; ensuring all consultation was conducted to IFC requirements. Becky's engagement experience includes: setting up and running workshops; preparing engagement plans, consultation databases, meeting minutes and presentation materials and participating in focus group discussions and stakeholder consultation. This engagement has included liaison and meetings with local potentially affected communities and fishing communities, fishing organizations, governing bodies and local academic institutions.

Becky specializes in marine environmental impact assessment and has significant experience in the preparation and management of a variety of Environmental, Health and Social Impact Assessments (ESIAs/ EIAs/ESHIAs), Environmental Statements (ESs), Habitat Regulations Assessments (HRAs), Appropriate Assessment (AAs) and Strategic Environmental Assessments (SEAs). As part of these works, Becky has managed a range of projects for clients including BP, BG Group, Statoil, EnQuest, Petrofac, PA Resources, GDF Suez, RWE, South Stream Transport B.V. and Wintershall.

EDUCATION

- MSc, Marine Environmental Protection, Bangor University, Wales, United Kingdom, 2009
- BSc (Hons), Marine Biology, University of Swansea, Wales, United Kingdom, 2003

PROFESSIONAL AFFILIATIONS & REGISTRATIONS

- Member of the Institute of Environmental Management & Assessment (IEMA)
- DECC Level 2 Corporate Manager (Oil Spill Response): Oil Spill Response (September 2011)

FIELDS OF COMPETENCE

- Marine Biology and Ecology
- Environmental Impact Assessment (EIA)
- Environmental Monitoring
- Oil and Gas Specialist
- Environmental Planning and Regulations
- Stakeholder Engagement

CONTACT DETAILS

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SELECTED PROJECT EXPERIENCE

SEISMIC SURVEY

- **2D and 3D Seismic Survey IEE, Offshore Myanmar, Tap Oil, 2015-Ongoing.** Becky is the Project Manager for 2D and 3D seismic surveys in Block M-7 in the waters offshore Mon State and Tanintharyi Region in Myanmar. The role includes client liaison, marine environmental baseline and impact assessment and preparation of the IEE Report to local Myanmar requirements.
- **2D and 3D Seismic Survey IEE, Offshore Myanmar, BG Group, 2015-Ongoing.** Becky is the Project Manager for a 2D and 3D exploration campaign (including seismic surveys, gravity & magnetic surveys and seabed sampling) in Blocks A-4 and Ad-02 in the waters offshore Rakhine State in Myanmar. The role includes client liaison, marine environmental baseline and impact assessment and preparation of the IEE Report to local Myanmar requirements. The work also involved stakeholder engagement in the Rakhine State in 4 townships to participate in focus group discussions on fishing and the environment. The engagement has also involved discussion with key stakeholders such as universities, NGOs, government authorities and Myanmar fishing associations.
- **2D Seismic Survey IEE, Offshore Myanmar, Statoil, 2015-ongoing.** Becky is the Project Manager for a 2D seismic survey in Block AD-10 in the waters offshore Rakhine State in Myanmar. The role includes client liaison, marine environmental baseline and impact assessment and preparation of the IEE Report to local Myanmar requirements. The work also involved stakeholder engagement in the Rakhine State in 2 townships to participate in focus group discussions on fishing and the environment.
- **Seismic Survey ESIA, Honduras, BG Group, 2014-2015**. Becky was the part of the marine ecological project team for an ESIA required for a seismic survey in Honduran Caribbean waters. Work involved the development of the marine ecological impact methodology and criteria, the preparation of the baseline and impacts assessment and development of mitigation measures and monitoring requirements.
- **Seismic Survey Application and ES, PA Resources, Greenland, 2010**. Becky was involved in the preparation of applications with an associated ES for proposed 3D seismic activity in Disko Bay (West Coast of Greenland). Work involved liaison with local authorities, review and assessment of baseline environmental data and environmental impact assessment.
- **Offshore oil and gas permitting, BP, RWE, GDF Suez, EnQuest, Wintershall, UK 2009-11**. Becky has undertaken over 15 applications for seismic surveys within the North Sea. These have included underwater noise modelling analysis, baseline creation and impact assessment to meet permitting requirements.

MIDSTREAM (PIPELINES)

- **South Stream Offshore Pipeline Project, South Stream Transport B.V., 2012-2014**. The SSOPP was a major development scheme to bring gas from the Russian gas fields to Europe via a pipeline under the Black Sea. Becky was the country manager for the Turkish EIA and ESIA process and was responsible for the delivery of all reports from scoping to final ESIA related to Turkish permitting requirements and international standards such as Equator Principles, World Bank and IFC Performance Standards. She was also responsible for delivering the marine ecology Chapters for all three countries (Russia, Bulgaria and Turkey). Becky also managed the stakeholder engagement aspects of the project within Turkey which included liaison with ministries, NGOs and academic organisations to support the national approval process. She also assisted with the stakeholder consultation primarily focused on fishing communities and organisations as the Project was located >100km from the coastline. Becky's responsibilities in the marine ecology aspects include: sole author of the scope of work for Turkish, Russian and Bulgarian marine survey. The survey included benthic, mammal and seabird surveys in the Black Sea and was undertaken to meet international standards, development of impact assessment criteria for marine receptors, preparation of the marine ecology chapters for the ESIA and assistance with the planning of HRA/Appropriate Assessment for Bulgaria and other required documents for permitting requirements.

EXPLORATION AND DRILLING

- **Exploration Drilling campaign EIA's, Offshore Myanmar, Woodside, 2016-Ongoing.** Becky is the Project Manager for two Projects for exploration drilling campaigns in Block A-6 and AD-7 offshore Rakhine State and Ayeyarwady Region in Myanmar. The role includes client liaison, marine environmental baseline and impact assessment, public consultation and stakeholder engagement, and preparation of the EIA Report to local Myanmar requirements.
- **Exploration Drilling EIA, Offshore Myanmar, Ophir, 2016-Ongoing.** Becky is the Project Manager for exploration drilling in Block AD-3 in the waters offshore Rakhine State in Myanmar. The role includes client liaison, marine environmental baseline and impact assessment and preparation of the EIA Report to local

Myanmar requirements. The work also involved stakeholder engagement in the Thandwe and Sittwe, Rakhine State to participate in focus group discussions on fishing and the environment.

- **3D Seismic Survey and Exploration Drilling IEE, Offshore Myanmar, Woodside, 2015-Ongoing.** Becky is the Project Manager for a 2D and 3D exploration campaign (including seismic surveys and exploration drilling) in Block AD-07 in the waters offshore Rakhine State in Myanmar. The role includes client liaison, marine environmental baseline and impact assessment and preparation of the IEE Report to local Myanmar requirements. The work also involved stakeholder engagement in the Sittwe, Rakhine State to participate in focus group discussions on fishing and the environment. The engagement has also involved discussion with key stakeholders such as universities, NGOs, government authorities and Myanmar fishing associations.
- **Conrie Field Development Environmental Statement (ES), EnQuest, UKCS 2011-2012**. Becky was project manager, lead author and focal point to deliver the ES for the Conrie Field Development in the Northern North Sea including 8 new wells and a tie-back to the existing Don Platform. This work included the preparation of an ES detailing impacts from construction of and production from the Conrie Field in the Northern North Sea. Work included liaison with statutory bodies, chemical, noise, air and other environmental impacts associated with oil and gas developments based on baseline surveys.
- **Don SW and West Don and Exploration offshore oil and gas permitting, EnQuest, 2010-2011**. Becky was project manager and focal point for environmental permitting work for EnQuest in their Don Field. Work involved the preparation of a variety of environmental permits (PONs/ OPPCs/ OPEPs) for drilling and intervening wells, seismic surveys and installing pipelines and platforms and liaison with regulatory bodies. Impact assessments were carried out for the following; Don SW and West Don, Heather and Ivy, Crathes and Knightsbridge.
- **BP Secondment, Aberdeen, BP, 2010 – 2011 (6 months).** Becky was seconded into the BP offices in Aberdeen to assist the wells and subsea environmental advisor with permitting regulations of all BP upstream activities in the UKCS. Work involved liaison with statutory bodies and preparation, tracking and submission of E&P permits for the UKCS.
- **Offshore oil and gas permitting, BP, RWE, GDF Suez, EnQuest, Wintershall, UK 2009-11.** Becky was project manager and focal point for environmental permitting work for EnQuest exploration drilling within the UKCS. Becky was also involved in the preparation and management of environmental assessments and permits of a number of well drilling and intervention programs for a variety of companies operating within the UKCS. Work included; preparation of ESs, seismic surveys applications, drilling and intervention permits for wells, permits for installation of pipelines, platforms and subsea templates.
- **Exploration drilling Oil Pollution Emergency Plans (OPEPs), EnQuest, Wintershall, BP, 2010-2011**. Becky was the lead author for a number of Oil Pollution Emergency Plans (OPEPs) for BP, Wintershall and EnQuest and undertook frequent liaison with governmental departments on the requirements of new legislation into oil spill response. This work involved assessment of oil spill models and key sensitivities in the area. The OPEP was prepared in accordance with new government guidelines.
- **Seaward License Round (R26) Applications, RWE and GDF Suez, 2010**. Becky authored the environmental appendix for RWE and GDF Suez to support their 26th round license applications. This involved identification of key sensitivities and assessment of any potential impacts.

INFRASTRUCTURE

- **Yangon Port, Phase 2 Development ESIA, Myanmar, 2016-ongoing.** Becky is the Project Manager for an ESIA Study of a port expansion in downtown Yangon, Myanmar. The work includes site surveys, baseline data collection, public consultation and stakeholder engagement to be conducted to IFC Standards. Becky is responsible for the overall management of the Project and production of the ESIA Report and EMP.
- **Semeikhon Port ESIA, Mandalay, Myanmar, 2016-ongoing.** Becky is the ESIA Expert for ESIA Study of a port expansion near Mandalay in Myanmar. The work includes site surveys, baseline data collection, public consultation and stakeholder engagement to be conducted to IFC Standards. Becky is responsible for the impacts assessment and production of the ESIA Report and EMP.
- **Power Cable Constraints Mapping, Transelec, Chile, 2011**. Becky was involved in constraints mapping for a proposed marine cable in Chile. The project aimed to link a new hydroelectric energy dam with the existing infrastructure. The work was mainly GIS based and involved analysis of baseline data and data from the local authorities on key sensitivities in the region.
- **EriGrid cable (England –Ireland Interconnector) ES, Ireland, 2009-2010**. Becky assisted in the preparation an ES for a power cable between Ireland and Wales. This involved analysis of baseline data in terms of key sensitivities observed along the cable route. The work also involved constraint mapping using GIS.

POWER

- **Habitats Regulations Assessments (HRA) for siting of a nuclear power station, DECC, 2010**. Becky assisted in the preparation of HRAs for two locations within the UK identified as potential sites for nuclear power stations. This work involved assessing potential impacts from the power plants in terms of the impact on neighbouring protected areas.
- **GTI and BWII Windfarms due diligence, Germany, 2009-10**. Becky was involved in the due diligence work for two large German windfarm developments in the North Sea. Work involved managing the translation of documents from German and overall document management for all key reports. Becky also prepared the environmental and permitting sections of a due diligence report to focus on any key issues that could arise from the proposed wind farms.

DUE DILIGENCE/RISK

- **TAP / TANAP ESIA Commitments Risk Assessment, BP, 2014**. Becky was the Project Manager for a risk assessment of ESIA commitments contained within the commitment registers for two gas pipelines (TAP and TANAP). This work involved a review, categorisation and pre-screening of the ESIA commitments in order to undertake a risk assessment. The risk assessment focused on business, HSE and financial risks (associated with the inaction of commitments) and highlights those with the greatest risk to the Project.

Bethwyn Lewis

Senior Consultant, Impact Assessment and Planning

Bethwyn Lewis is a Senior Consultant with Environmental Resources Management, based in Perth, Western Australia (WA).

Bethwyn has nine years of experience in onshore and offshore environmental investigations and management. This includes providing environmental approvals advice under the *Environmental Protection Act 1986* (EP Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

She has worked with a range of extractive industry clients in Western Australia. For example, Bethwyn was a key member of the team responsible for preparing the primary environmental approvals for the Tropicana Gold Project - an open-cut gold mine located in the Great Victoria Desert of Western Australia. Bethwyn was the lead author of the Public Environmental Review, Response to Submissions documents, and a number of supporting environmental management strategies (construction, operational and threatened species).

Bethwyn is often sought out for not only her technical expertise, but also her project management capabilities. She has project managed a range of environmental approvals for extractive industry clients.

Fields of Competence

- Project planning and management.
- Environmental approvals advice and management.
- Environmental impact assessment.
- Approvals document preparation.

Education

Bachelor of Science (Zoology, second major Environmental Conservation Biology) (1st Class Honours), Monash University, Melbourne, 2007.

Training and Qualifications

- Senior First Aid
- "C" class driver's licence
- Four-wheel Driving Training – DTEC
- Environmental Impact Assessment Training for Practitioners – EPASU/ECA
- PADI Open Water Diver
- Certified Venomous Snake Handling

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Key Projects

Client Confidential. Onshore Site Selection. January 2016 - present. Project Manager responsible for a site selection project for an onshore facility. Tasks include environmental approvals strategy, schedule and planning for WA State approvals and the generation of an ESHIA scoping workshop and report.

Searcher Seismic. Offshore Seismic EP. November 2015- April 2016. Project Manager responsible for the preparation and coordination of an Environment Plan for an offshore seismic EP. EP accepted by NOPSEMA on April 2016.

Woodside. August 2015 – present. Project Manager and technical review for environmental impact assessments for a seismic and exploration drilling campaign in Myanmar.

Client Confidential. Operating Management System Support – July 2015. Project Manager for an applicability review of HSE legislation relevant to the organisation's activities, products and services.

Woodside Browse FLNG EIS, 2014. Environmental advisor to the Browse Floating Liquefied Natural Gas (FLNG) Project, including contributing author of the Environmental Impact Assessment (EIS) for assessment under the EPBC Act.

Client Confidential, Environmental Approvals for an Onshore Seismic Survey, 2014.
Project Manager for the environmental approvals for an onshore seismic survey in the Canning Basin, Western Australia. Tasks include scoping of environmental studies, coordination of remote biological surveys, subcontractor and HSE management, regulatory strategic advice, client liaison and management of the development of environmental approvals documentation.

Woodside Browse FLNG EPBC Referral, 2013. Project Manager and lead author responsible for the preparation of the Browse FLNG EPBC Referral for submission to the Federal Department of the Environment.

ConocoPhillips Bayu-Undan Environment Plans and OSCP, 2013 - 2014. Project Manager and lead author responsible for the preparation and coordination of two Environment Plans (Drilling and Construction), and an Oil Spill Contingency Plan (OSCP) Undan Development, in the Timor Sea.

Chevron Wheatstone Trunkline Installation Environment Plan, 2013.
Project Manager and author responsible for a technical update to the Trunkline Installation Environment Plan (IEP) and Oil Spill Operational Response Plan (OSORP) for activities in State waters, to be assessed by the WA Department of Mines and Petroleum. A key focus is to align the IEP with an equivalent Environment Plan for activities in Commonwealth waters, to be assessed by NOPSEMA.

ExxonMobil, FLNG Supporting Studies, 2013-ongoing.
Scope manager responsible for the coordination of technical studies including spill, air quality, and discharges modeling for an FLNG project offshore WA.

Woodside Angel Facility Operations Environment Plan, WA. 2012.
Contributing author to the Angel Facility Operations Environment Plan for submission to NOPSEMA for assessment under the OPGGS Act. The Environment Plan was approved by NOPSEMA in March, 2013.

ConocoPhillips Biodiversity Risk Assessment, Australia-wide, 2012.
Project Manager responsible for the Biodiversity Risk Assessment for ConocoPhillip's Australian Business Unit's onshore and offshore operations and development areas in Australia. The four areas of operation within the ABU were facilities associated with the Bayu-Undan Field, the Darwin Liquefied Natural Gas (LNG) plant, the Australia Pacific LNG (APLNG) plant and ConocoPhillips' exploration activities in the Browse Basin.

Hess Equus Project EIA, WA. 2012.
Project Manager responsible for the preparation and coordination of a multidisciplinary EIA for an offshore field development. Contributing author of an Environmental Risk Assessment (ERA) for an oil spill during the drilling program at WA-390-P, and contributing author of Preliminary Documentation in support of the Equus Project's assessment under the EPBC Act.

Gorgon Gas Development, Fourth Train Proposal, WA. 2012.
Project Manager and contributing author of an oil spill ERA based on the hydrocarbon spill trajectory modelling for a range of spill scenarios, including a 'worst case' loss of well control scenario. The ERA is part of supporting documentation for Chevron's federal Draft Environmental Impact Statement submission.

Offshore Seismic Programs, WA, NT. 2010-2012.
Project Manager responsible for the environmental impact assessment, stakeholder and agency liaison and environmental approvals under the OPGGS Act and federal EPBC Act for numerous offshore marine seismic surveys.

Onshore Seismic Programs, WA. 2010-2012.
Project Manager and lead author of approvals documentation for four onshore seismic surveys under the PGER Act and EPBC Act. Surveys have been located throughout WA, including the Perth Basin, Carnarvon Basin and Canning Basin (West Kimberley). Tasks included scoping of environmental studies, coordination of remote biological and aboriginal heritage surveys, subcontractor and HSE management, EIA, Threatened species management, approvals report preparation, regulatory strategic advice, and stakeholder and agency (Federal and State) liaison.

Offshore Drilling Programs, WA, NSW. 2010-2012.
Preparation of Environment Plans under the OPGGS Act for exploration drilling programs located on the North West Shelf, WA, and the Offshore Sydney Basin, NSW.

Nautilus Minerals Solwara Project, WA. 2011.
Project Manager for an EIA and Marine Fauna Management Plan for minerals exploration in the Bismarck Sea, Papua New Guinea.

BHP Macedon Project, WA. 2011-2012.
Marine Fauna Observer under the Department of Environment and Conservation (DEC) approved Marine Turtles Impact Management Protocol - Macedon Gas Development.

Tropicana Gold Project, WA. 2008-2012.
Environmental consultant responsible for the provision of environmental approvals advice under the EPBC Act, and the EP Act for an open-cut gold mine in the Great Victoria Desert. Contributing author of the Public Environmental Review and Response to Submissions documents, and a number of environmental management strategies (construction, operational and Threatened species).

Southern Seawater Desalination Project, Western Ringtail Possum Survey, 2010.
Project Manager of a five year study for the Western Ringtail Possum as part of the Water Corporation's environmental approval conditions imposed by the Department of Environment, Water, Heritage and the Arts.

Grange Desalination Project, WA. 2009-2011.
Project Manager for the baseline environmental investigations including scoping, analysing and reporting of 12 months (seasonal) marine water quality monitoring data and management of the Aboriginal Heritage Assessment.

Ningaloo Marine Turtle Conservation Project, WA. 2005–2006.
Team Leader responsible for the management of the Jurabi Turtle Centre, an educational facility in the Cape Range National Park including volunteer management, stakeholder liaison and delivery of nightly oral presentations. Trained in the monitoring of the nesting activity of green, loggerhead and hawksbill turtles along the Jurabi coastline and contributed to the collation and analysis of project data for the annual report.

Piers Touzel

Partner

Mr Touzel is the Managing Partner for ERM's Impact Assessment and Planning Practice in the Asia Pacific Region, based in Hong Kong. He has managed or provided technical input to over 50 Environmental and Social Impact Assessments (ESIA) and Resettlement Plans for clients in China, Southeast Asia, Africa and Mongolia. He has undertaken ESIAs across a range of industry sectors according to the following financial institution standards: World Bank, IFC, European Bank for Reconstruction and Development and the Asian Development Bank. He has prepared Resettlement Planning Frameworks and Resettlement Plans in China, Southeast Asia, Africa and Central America.

Mr Touzel has undertaken impact assessments, due diligence and resettlement planning for hydropower and related infrastructure projects.

Myanmar Experience

Mr Touzel is currently leading two environmental and social reviews in Myanmar. The first is for a controversial (and confidential) extractive industry investment where key issues relate to land use, resettlement and community relations. The second project is an Environmental and Social Impact Assessment of the Mandalay Industrial Park on behalf of a multilateral investment organisation.

Professional Affiliations & Registrations

- Society of Petroleum Engineers

Fields of Competence

- International ESIA
- Resettlement Planning
- Stakeholder Engagement

Education

- Master of Business Administration, Rutgers, State University of New Jersey, 2012
- Bachelor of Science (Chemistry), University of Melbourne, 1999
- Bachelor of Arts (Chinese), University of Melbourne, 1999
- Beijing Language and Culture University, Language Certificates C and B, 1997

Languages

- English (native)
- Mandarin (fluent)

Key Industry Sectors

- Infrastructure
- Oil & gas
- Mining
- Chemicals/Petrochemicals

Environmantal and Social Impact Assessment

Environmental and Social Impact Assessment for the Chuandongbei Gas Project, Sichuan, China (Chevron), **2007- 2013.** Mr Touzel was the Partner in Charge of ESHIA preparation for a multi-phase onshore gas development in southern China. The project involves the extraction and purification of high-sulphur natural gas. Residents located close to surface facilities and sour gas pipelines will be relocated to allow for the safe operation of the project.

Environmental and Social Impact Assessment and Resettlement Planning Framework for an Iron Ore Mine, (Wuhan Iron and Steel Company -武钢), Liberia, 2011-12. ESIA referencing IFC Performance Standards submitted for regulatory approvals.

Regulatory EIA for an Onshore Gas Development, (Total E&P China/Petrochina), 2008-11. Mr Touzel was the the Partner in Charge of this EIA for regulatory submission to the Ministry of Environmental Protection for an onshore gas development in Inner Mongolia.

Environmental and Social Impact Assessment for a Proposed 12 Mtpa Coal Mine in Shaanxi Province, China, **(Anglo Coal), 2005- 2009. Mr Touzel was the Partner in Charge.** The project involves a 12 Mtpa open pit coal mine, coal gasification and coal to liquids plants in an adjacent chemical park. ERM was retained to undertake an ESHIA, including preliminary consultation with communities that will be displaced by the mine, and to liaise with local government authorities on EHS permitting and land administration issues. The project will require displacement of several thousand local residents and consequently, resettlement (and the capacity of local government to manage this process) was a key issue for the project.

Regulatory EIA for the Shenzhen to Zhongshan Corridor, China, **2009-2012 (*Shenzhen Transportation Bureau*)**. Mr Touzel was the Partner in Charge of a Regulatory EIA for this major infrastructure project comprising subsea tunnels and roadways totally 51 km in length. The EIA report was review and approved by China's Ministry of Environmental Protection.

EIAs and Permitting Support for Four Roads in Yunnan Province, China, **2009-11** (*Government Client*) Mr Touzel was the Partner in charge of Regulatory EIA and associated permitting support of four road construction projects in Yunnan that were approved by the Yunnan Provincial Environmental Protection Bureau.

Bankable ESHIA for a Coal to Liquids Facility (Confidential Client), 2009. Mr Touzel is the Partner in Charge of a bankable ESHIA for a coal to liquids project in Ningxia, China.

ESHIA for CBM Appraisal Drilling and Seismic Exploration, (Confidential Client), 2008-2009. **Mr Touzel was the Project Director** ERM undertook an ESHIA for a seismic exploration and appraisal drilling programme for a CBM project located in Shanxi Province.

Regulatory EIA and Bankable ESHIA of a Gold Mine in Inner Mongolia, (Jinshan Gold Mines), 2005-2006. **Mr Touzel was the Project Manager.** The project involved an open cut gold mine and leaching plant. ERM partnered with the Inner Mongolian Institute of Environmental Science to undertake an EIA for regulatory submission and a bankable ESIA in accordance with IFC Performance Standards. Key issues for the project included the sustainability of the Project's water demand, the restriction of grazing areas for ethnic Mongolian herdsman and community engagement.

Environmental and Social Impact Assessment of a Coal to Chemicals Facility in Inner Mongolia, (Xinao Group- IFC): **Mr Touzel was the Technical Reviewer for the social component of the ESIA, 2005-2006**. ERM was commissioned to undertake a bankable ESIA for the construction of a chemical plant in Inner Mongolia. Key issues for the project were resettlement and planning issues within the safety buffer distance of the proposed facility and a neighbouring pharmaceutical plant also operated by Xinao Group.

Environmental and Community Risk Assessment of a Bauxite Mine in central Vietnam, (BHP Billiton), 2005. Mr Touzel undertook an environmental and community risk assessment for a proposed mining development in the southern central highlands of Vietnam. The proposed mining area and transport corridors are home to over 30 ethnic minorities. Indigenous (and other minority) peoples and resettlement were the key issues.

Social and Health Impact Assessment (SHIA) for the Hangzhou City Gas Ring Project, **(Shell China Gas and Power Ltd), 2003-4. Mr Touzel was the Project Manager.** The SHIA addressed issues associated with the installation and operation of a ring main in Hangzhou City, the capital of eastern China's Zhejiang

Province. Key issues for the project were resettlement to allow pipeline installation and management of the non-local construction workforce.

BP Zhuhai LPG Phase II Extension ESIA, **BP 2003. Mr Touzel was the principal author responsible for 'upgrading' the EIA produced for Chinese regulatory compliance to a standard consistent with internationally accepted practices.** An ESIA was undertaken for the construction and operation of two underground LPG cavern storage facilities which receive gas by sea tanker for distribution throughout the Pearl River Delta. The major issue was related to the storage of surplus spoil material which was planned for use in further reclamation along the foreshore adjacent to the project site.

ESHIA for the Upstream West to East Pipeline Project (WEPP), **Shell China Exploration and Production Co. Ltd, 2002-2003.**
Key issues for the project were waste management associated with drilling cuttings during the construction phase and the disposal of saline produced water during the operational phase. ERM partnered with the Xinjiang Environmental Science Institute, which provided local expertise and field support.

ESIA of the West to East Pipeline Project (WEPP), **Shell China Exploration and Production Co. Ltd, 2002-2003. Mr Touzel was a principal author of the ESIA.** Covering a distance of almost 4,000 km, the WEPP will transport natural gas from the Tarim Basin in Xinjiang for end use by power generators and other industry along China's industrialised eastern seaboard, thereby reducing the reliance on coal-fired power. Key issues for the project were ecological impacts associated with Nature Conservation Areas through which the WEPP passes and cultural heritage management of archaeological relics unearthed during pipeline construction. The United Nations Development Programme undertook a Social Impact Survey of project-affected communities along the pipeline alignment and the findings were incorporated into the ESIA Report.

Resettlement Planning & Monitoring

Resettlement Planning Framework for the Nicaragua Grand Canal Project,**HKND 2013-4.** Mr Touzel was the Partner in Charge of the preparation of the Resettlement Planning Framework for a $50 billion canal and associated infrastructure.

Resettlement Planning Framework for Confidential Port development,**Nigeria 2013.** Mr Touzel developed a resettlement planning framework following IFC Performance Standards (2012) for a proposed port development in Lagos, Nigeria.

Land Acquisition and Compensation Audit, Confidential Client, Sichuan, August 2008. ERM was commissioned by a chemical company to undertake a land acquisition and compensation review against IFC's Performance Standard 5: Land Acquisition and Involuntary Resettlement. The key issue was prolonged transition time and insufficient livelihood restoration strategies.

Resettlement Planning and Monitoring for the Chuandongbei Gas Project (Chevron), **2008-2013.** Mr Touzel was the Partner in Charge of the preparation of resettlement documentation and implementation support for the CDB Project being jointly developed by Chevron and PetroChina. The project will relocate around 2,000 residents.

ERM was commissioned to develop a Temporary Land Access and Compensation Procedure, to oversee negotiations with Government for temporary land use, and to conduct external review of negotiations and compensation payments. ERM acted as an external Third Party Monitor to oversee the land access processes in compliance with Chinese legal requirements, FCPA requirements, and relevant IFC's performance standards. In addition, ERM drafted the Resettlement Grievance Procedure and provided in-field support for the implementation of the procedure for a period of three years.

Resettlement Planning Framework for an Open-cast Coal Mine, Anglo American plc, 2007-8. ERM prepared a preliminary resettlement planning framework for a proposed open cast coal mine that would require resettlement of approximately 3,000 residents. Piers led this work and also calculated expected costs of land acquisition, physical resettlement and livelihood restoration measures.

Post-resettlement Land Acquisition and Resettlement Review, IFC, 2007 ERM was commissioned by IFC to conduct a land acquisition and resettlement review for two chemical plant sites to identify gaps between current practices and IFC performance standards and recommend action plans to bridge non-compliances.

Resettlement Monitoring, (Confidential Client), 2006. Mr Touzel was the technical reviewer for a post-resettlement audit to assess the adequacy of

compensation and livelihood restoration for a client seeking finance from the IFC.

SIA and Land Acquisition/Resettlement Plan **Guangdong Dapeng LNG Co, Ltd (BP/CNOOC joint venture), 2004-2006. Mr Touzel was the Project Manager.** The project involves the construction of a receiving facility and installation of a 350 km LNG pipeline in southern China. The Project Proponents sought to ensure that land acquisition and resettlement was conducted in a fair and transparent manner. ERM developed procedures that harmonise local standards and procedures with internationally accepted practices, as recommended by the IFC/World Bank.

Resettlement Review**, (Tarmac Materials) 2003.** Mr Touzel undertook a review of the proposed resettlement procedures to be adopted by local government for a quarry that has been acquired by Tarmac, a wholly owned subsidiary of Anglo American Group. Resettlement and compensation procedures were benchmarked against World Bank Policy and Anglo American Group's corporate policy on involuntary resettlement. Where shortcomings were identified, recommendations were made to bridge these gaps in order to comply with relevant policy guidelines in a Chinese context.

Resettlement Action Plan **(Tarmac Aggregates), 2003-4.** Mr Touzel was the Project Manager. ERM was commissioned to prepare a RAP that conforms with World Bank Group Resettlement Policy in a Chinese context. As part of the assignment, ERM arranged detailed land surveys to be undertaken as the basis for land acquisition plans and compensation payments by a licensed agency. ERM is working with local government, including resettlement authorities, to address the shortcomings in local resettlement practices with respect to World Bank Policy.

Due Diligence and Strategic Assessments

Environmental and Social Due Diligence of Five Underground Coal Mines for a confidential Equator Principles Financial Institution, 2010. Mr Touzel was the Partner-in charge of a due diligence assignment of five coal mines in Guizhou Province, China. Mr Touzel and his team assisted the lenders to prepare an environmental and social action plan that translated non-compliance issues into loan covenants with the borrower.

Environmental, Social and Resettlement Due Diligence for an Onshore gas Development, (Confidential Client) **2007. Mr Touzel was the Project Director.** ERM undertook environmental and social due diligence of an onshore gas development on behalf of a multinational oil company considering entering a joint venture with a Chinese national oil company.

Strategic Environmantal and Social Advice for Proposed Coal to Liquids Facilities in China, (Confidential Client) 2006. Strategic advice on Chinese legal requirements for EHS permitting in China and compliance with the IFC's *Social and Environmental Sustainability Standards* in China. Mr Touzel and colleagues presented a 5 day workshop on China EHS issues and IFC requirements.

Lenders' Independent Environmental and Social Review for Oyu Tolgoi Mine, Mongolia, 2011-12. Mr Touzel was the independent social specialist responsible for review of resettlement and social performance.

Environmental and Social Due Diligence of a Nickel Mines Confidential Client, Philippines, 2010-11. Mr Touzel was the Partner in Charge. ERM was commissioned to undertake due diligence and prepare the disclosure documentation for an independent technical review of a nickel mine in the Philippines for listing on the Hong Kong Stock Exchange.

Environmental and Social Due Diligence of four mines in China, Confidential Client, 2010-11. Mr Touzel was the Partner in Charge. ERM was commissioned to undertake due diligence and prepare the disclosure documentation for an independent technical review of mines and processing facilities being listed on the Hong Kong Stock Exchange.

Nicci Ng
Consultant
Geographic Information Systems
ERM Hong Kong

Key Projects

GIS in Environmental, Social Impact Assessment (ESIA)

Myanmar Environmental and Social Impact Assessment (ESIA) Block AD-7, JV of Woodside Energy (Myanmar) Pte. Ltd. And Daewoo International Cooperation (2015).
GIS Specialist
The Joint Venture (JV) Partnership of Woodside Energy (Myanmar) Pte. Ltd and Daewoo International Cooperation plans to undertake a 3D marine seismic survey and drilling of one exploration well (Tha Lim A) in Block AD-7, located in the Bay of Bengal, approximately 100km offshore of west coast of Myanmar. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

Myanmar: Environmental and Social Impact Study for Offshore Bay of Bengal Block A- and AD-02, BG Group (2015).
GIS Specialist
BG Group is planning to undertake an exploration campaign in the waters offshore of the Rakhine State in Myanmar. This campaign will inform future drilling for hydrocarbons by means of a combination of 2D and 3D seismic surveys, gravity and magnetics surveys and seabed sampling surveys. The Project requires an IEE as the appropriate level of assessment. BG Group has commissioned ERM, supported by local specialists to undertake the IEE Study. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

2D Seismic Survey in Block AD-10, Statoil (2015).
GIS Specialist
Statoil is planning to undertake an exploratory campaign by means of 2D seismic surveys in Block AD-10. Block AD-10 is located at the Rakhine Basin, Offshore Myanmar at a distance of about 200 km from the coast, covering an area of 9000 sq. km. The Project requires an IEE as the appropriate level of assessment. BG Group has commissioned ERM, supported by local specialists to undertake the IEE Study. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

ESIA/ESHIA Study for Geophysical Data Acquisition Programs in Block A-5, Offshore Myanmar, Unocal Myanmar Offshore Co. Ltd. (Chevron Corporation) (2015).
GIS Specialist
UMOL is planning to undertake geophysical data acquisition programs in Block A-5 during the Study Period. UMOL has commissioned ERM, supported by REM to undertake the IEE Study for the porposed geophysical data acquisition program in Block A-5. The overall purpose of the Study is to complete a robust IEE to meet requirements of the procedures for the IEE to be approved by the Ministry of Environmental Conservation and Forestry. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

Environmental and Social Impact Assessment (ESIA) for a 500MW Pumped-Storage Hydropower Project (Project Wawa), Olympia Violago Water & Power Inc. (2015-Ongoing).
GIS Specialist
OVPI requires a comprehensive ESIA to be undertaken, what will satisfy international best practices for a proposed 500 MW pumped-storage hydropower project, located within the City of Antipolo, Municipalities of San mateo and Rodriguez, Rizal Province, Luz
on, the Philippines. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

Marine Seismic Survey for Block M-8, Offshore Myanmar, B*erlanga Myanmar Pte Ltd. (2015).*
GIS Specialist
Berlanga Myanmar Pte Ltd. was awarded the offshore Block M-8 in Myanmar, under a Product Sharing Contract (PSC) with local authorities, Ministry of Energy. Berlanga intends to conduct Oil and gas marine seismic exploration activities as part of a program of work. In relation to the above, Berlanga has

has commissioned Environmental Resources Management (ERM), supported by local specialists from Resource and Environment Myanmar (REM), to undertake an IEE Study for the proposed seismic survey in Block M-8 in accordance with the requirements of the Procedure. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

EIA, SIA and EMP for Seismic Survey of Onshore Block MOGE-4, Myanmar, CAOG Pte. Ltd (CAOG) (2015).
GIS Specialist
CAOG Pte. Ltd (CAOG) was awarded the onshore Block MOGE-4 to operate on behalf of partner Apex Geo a Production Sharing Contract (PSC) for Myanmar Oil & Gas Enterprise (MOGE). CAOG is planning to conduct 2D seismic exploration activities across the whole Block MOGE-4, and possibly 3D exploration activities over the perceived more prospective northern part of the block. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

Environmental and Social Impact Assessment for the Seismic Survey and Workover Activities of Myanmar Onshore Block IOR 4 and IOR- 6, MPRL E&P Pte Ltd (MPRL E&P) (2015).
GIS Specialist
MPRL E&P Pte Ltd (MPRL E&P) was awarded the Exploration Block IOR - 4 and 6 in October 2013 to jointly operate with Myanma Oil & Gas Enterprise (MOGE) under Improved Petroleum Recovery (IPR) Contract. Following the contract award, MPRL E&P is planning to conduct seismic exploration activities, possibly consisting of 2D and 3D surveys, across Block IOR-4 and IOR 6. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

ESHIA Study for 1280MW USC Coal Fired Power Plant Project, Toyo-Thai Corporation Public Company Limited, Myanmar (2015).
GIS Specialist
Toyo-Thai is planning to develop a coal fired power plant in Ye Township, Mon State, Myanmar. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

EIS and ESIA for a proposed hydropower plant and pumped storage facility, SN Aboitiz Power Generation, The Philippines (2014-Ongoing).
GIS Specialist
ESIA and local Environmental Impact Statement (EIS) for a 130MW hydroelectric power plant and 250MW pumped storage facility in northern Philippines. As the GIS Specialist, Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

Initial Environmental Examination (IEE) and ESIA for a proposed gas-fired power project, GMS Power and GPSC Group, Myanmar (2014-Ongoing).
GIS Specialist
A preliminary E&S risk assessment for a 500MW combined cycle gas-fired power project in Kyaitlat, Ayeyarwady Region in Myanmar. Nicci is responsible for reviewing, manipulating, processing and management the survey data. She is also responsible for creating a series of survey maps and processing the survey data and delivering a series of maps for reports.

Environmental, Social and Health Impact Assessment for Exploratory Drilling of Block 15/10 in the South China Sea, Chevron, China (2014).
GIS Specialist
ERM is commissioned by Chevron to undertake an ESHIA Study for the proposed exploratory drilling of Block 15/10 in the South China Sea. Nicci is responsible for data processing and data management and delivering a series of maps for reports.

Environmental, Social and Health Impact Assessment for Phase 2 Exploratory Drilling in Pearl River Mouth Basin, South China Sea, Chevron, China (2013).
GIS Specialist
ERM were commissioned by Chevron to undertake an ESHIA Study for the proposed Phase 2 Exploratory

Drilling at Block 42/05 within the Pearl River Mouth Basin of South China Sea. Nicci is responsible for data processing and data management and delivering a series of maps for reports.

Environmental, Social and Health Impact Assessment for Marine 3D Seismic survey of Block 15/10 and Block 15/28 in the South China Sea, Chevron, China (2013).
GIS Specialist.
ERM were commissioned by Chevron to undertake an ESHIA Study for the proposed marine 3D seismic survey of Block 15/10 and Block 15/28in the South China Sea. Nicci is responsible for data processing and data management and delivering a series of maps for reports.

Coc San Hydropower Project ESIA, Confidential Client, Vietnam (2013)
GIS Specialist
Nicci is responsible to work on all the maps for the project, tasks include consolidate the survey data (survey location, points, and also habitats) and provide quantitative analysis for the project team.

GIS in Environmental Impact Assessment (EIA)

Cross Island MRT Line (EIA), Land Transport Authority, Singapore (2014-Ongoing).
GIS Specialist
A project to build a major MRT line, the 50 km Cross Island Line (CRL), which will run across the span of Singapore. Nicci is responsible to acquire, manipulate and consolidate the data from different sources, and deliver a series of maps to the surveyors, the Client and also for report submission.

Tseung Kwan O Desalination Plant, Water Supplies Department, Hong Kong (2013–2014)
GIS Specialist
A project profile and quantitative risk assessment was required for the application of EIA Study Brief. Nicci is responsible to deliver various maps including Landscape Character Areas (LCA), Landscape Resources (LR), Outline Zoning Plans (OZP), and as well as to create figures for visual impacts by generating visual envelops for the selected project sites.

Environmental Impact Assessment (EIA) and Historical Land Use Surveys (HLUS) for North South Expressway – Package B – Ove Arup for Land Transport Authority, Singapore (2013)
GIS Specialist
The North-South Expressway (NSE) is Singapore's eleventh expressway. It will run parallel to the Central Expressway (CTE) to alleviate the traffic load on the heavily utilized CTE as well as nearby major arterial roads. Nicci is responsible to deliver a series of land use maps with the new alignments.

Environmental Impact Assessment (EIA) and Historical Land Use Surveys (HLUS) for North South Expressway – Package C – Ove Arup for Land Transport Authority, Singapore (2013)
GIS Specialist
The North-South Expressway (NSE) is Singapore's eleventh expressway. It will run parallel to the Central Expressway (CTE) to alleviate the traffic load on the heavily utilized CTE as well as nearby major arterial roads. Nicci is responsible to deliver a series of land use maps with the new alignments.

Agreement No. CE 15/2010 (DS) Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities – Design and Construction (Ecological Baseline Survey), Hong Kong (2011-2013)
GIS Specialist
The project is to conduct terrestrial and marine ecological baseline surveys for Project. Nicci is responsible to deliver a series of ecological survey maps of the project areas, which includes habitat, Landscape Character Areas (LCA), Landscape Resources (LR), Outline Zoning Plans (OZP), and as well as to create maps for survey transects and sampling points for terrestrial and freshwater fauna survey for the project sites.

Agreement No. CE 6/2002 (DS) Drainage Improvement in Northern New Territories – Package C – Investigation, Design and Construction, Drainage Services Department, Hong Kong (2011-2013)
GIS Specialist
The project is to carry out an Environmental Impact Assessment (EIA) for the Project and identify, assess, resolve and advise on the environmental issues arising from the Project. Nicci is responsible to deliver a series of maps that includes habitat maps, NSR/ASR location maps, Landscape Character Areas (LCA), Landscape

Resources (LR), and Outline Zoning Plans (OZP).

Environmental Impact Reassessment for the Revised Scheme of South East New Territories Landfill Extension, Environmental Protection Department, Hong Kong (2011-2013)
GIS Specialist
The objective of the assignment is to review and assess the environmental impacts of the revised scheme of South East New Territories (SENT) Landfill Extension and prepare documents for submission to the Environmental Impact Assessment Authority for variation of the existing Environmental Permit. Nicci is responsible to deliver a series of maps that includes habitat maps, NSR/ASR location maps, Landscape Character Areas (LCA), Landscape Resources (LR), and Outline Zoning Plans (OZP).

Agreement No. CE 61/207 (CE) North East New Territories New Development Areas Planning and Engineering Study – Investigation, Planning Department, Hong Kong (2011-2013)
GIS Specialist
An EIA study to provide information on the nature and extent of environmental impacts arising from the construction and operation of the developments proposed under the Project and related works that take place currently. Nicci is responsible to deliver various maps including Landscape Character Areas (LCA), Landscape Resources (LR), Outline Zoning Plans (OZP), and as well as to create figures for visual impacts by generating visual envelops for the selected project sites.

Agreement No. CE 33/2011 (CE) Planning and Engineering Study on Future Land Use at Ex-Lamma Quarry Area at Sok Kwu Wan, Lamma Island – Feasibility Study, Ove Arup for CEDD, Hong Kong (2012 – 2013)
GIS Specialist
The project is to carry out an Environmental Impact Assessment (EIA) for the Project and identify, assess, resolve and advise on the environmental issues arising from the Project. Nicci is responsible to deliver a series of maps that includes habitat maps, Landscape Character Areas (LCA), Landscape Resources (LR), and Outline Zoning Plans (OZP).

Weda Bay Nickel, Environmental Management and Monitoring Plan for Pre-Construction Minerals Conservation Programme (2011-2012)
GIS Specialist
Nicci is responsible to process all the survey data and present them in maps, and deliver series habitat maps of the Weda Bay to the client.

Hong Kong Offshore Wind Farm in Southeastern Waters - Cable Route Desktop Study, CLP, Hong Kong (2011-2012)
GIS Specialist
Nicci is responsible for delivering series constraint maps of Southeastern waters region in Hong Kong. She has to prepare comprehensive environmental, physical and land use planning maps for the constraints analysis of the potential new cable systems landing in Hong Kong.

Agreement No. CE 43/2010 (HY) Central Kowloon Route – Design and Construction, Highways Department, Hong Kong (2011-2012)
GIS Specialist
The project is to construct and operate a dual-3 lane tunnel, across the Kowloon Peninsula linking the West Kowloon Reclamation in the west and the proposed Kai Tak Development in the east. An EIA study is conducted to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities taking place concurrently. Nicci is responsible for the data presentation for the landscape visual impact assessment phase. She is responsible to deliver maps of Landscape Character Areas (LCA), Landscape Resources (LR), Outline Zoning Plans (OZP), and visual impacts figures for the affected works areas.

Agreement No. CE 4/2010 (TP) Planning Study on Future Land Use at Anderson Road Quarry – Feasibility Study, Planning Department, Hong Kong (2011-2012)
GIS Specialist
The feasibility study aims to identify and assess the potential cumulative environmental impacts arising from the land use proposals and other planned/committed developments within the Study Site and Study Area. Nicci is responsible to deliver various maps including Landscape Character Areas (LCA), Landscape Resources (LR), Outline Zoning Plans (OZP), and as well as to create figures for visual impacts by generating visual envelops for the project site.

Agreement No. CE35/2009 (HY) Elevated Walkway System Along Gloucester Road – Investigation, Highways Department, Hong Kong (2011-2012)
GIS Specialist
A landscape and visual impact appraisal (LVIA) is conducted to the establishment of the elevated walkway along Gloucester Road, which is one of the busiest areas in Hong Kong. Nicci is responsible to deliver various maps including Landscape Character Areas (LCA), Landscape Resources (LR), Outline Zoning Plans (OZP), and as well as to create figures for visual impacts by generating visual envelops for the selected project sites.

3D Environmental Impact Assessment for CLP Sludge Treatment Plant – Design Phase, CLP, Hong Kong (2008)
GIS Programmer
Nicci is responsible to process aerial photo, data processing, and programming VRML models for the unmitigated and mitigated 3D models of the CLP Sludge Treatment Plant.

GIS in Database and Data Management

GIS Database Update for Brunei Shell Petroleum, Brunei (2015).
Project Manager and GIS Specialist
To provide service to manipulate and also convert the new survey data to a new database. Update the existing database for the client to fulfil the client's needs. Create data standard document and data dictionary for the database.

Climate Change Risk Screening Tool for CLP Investments, CLP, Hong Kong (2015).
GIS Specialist
To develop a GIS database for identifying the natural hazards and climate change related risks on a global scale. Tasks include develop natural hazard and climate projection dataset and develop the climate change screening tool.

Provision of Services for the Updating of the Wetland Inventory with Field Verification and Digitization on GIS, Phase 2, Agriculture, Fisheries and Conservation Department, Hong Kong (2014).
Project Manager and GIS Specialist.
To provide service to update the records of the existing Wetland Inventory GIS database based on aerial photo images. Nicci is the project manager who is responsible for the updating works and all project management works include coordinate with client and ecological surveyors, data QC and ensure deliverables are submitted on schedule.

Glass Bottle Collection Study, Environmental Protection Department, Hong Kong (2014).
GIS Specialist
A project to GIS technology to present information on waste glass bottles arisings across the 18 districts (based on the District Council geographical boundaries). An interactive map will be produced which allows users to investigate the distribution of waste glass bottles for each district. Data will be overlaid on the GIS system and will take into account variables such as population density, residential property density, locations of food and beverage (F&B) establishments. Nicci is the task manager who is responsible to design and build the GIS database; she is also responsible to supervise other junior staffs to work on data collection and manipulation for the GIS database.

Provision of Services for the Updating of the Wetland Inventory with Field Verification and Digitization on GIS, Phase 1, Agriculture, Fisheries and Conservation Department, Hong Kong (2013).
Project Manager and GIS Specialist
To provide service to update the records of the existing Wetland Inventory GIS database based on aerial photo images. Nicci is the project manager who is responsible for the updating works and all project management works include coordinate with client and ecological surveyors, data QC and ensure deliverables are submitted on schedule.

GIS Database Design and Data Conversion for Brunei Shell Petroleum, Brunei (2013).
Project Manager and GIS Specialist
To provide service to convert the current survey data for the client and also to design the database for the current and future survey data to fulfil the client's needs. Create data standard document and data dictionary for the database.

GIS in Mapping

Site Selection for Hong Kong Floating Storage Regasification Unit (FSRU) Project, CLP (2015)
GIS Specialist
CLP is currently exploring siting of an FSRU as an additional gas option to meet Hong Kong's future fuel supply needs. With respect to the preliminary advice from EPD and AFCD, it is recommended to submit a Site Selection Report to Government Departments to obtain some initial alignment on the preferred site prior to submitting a Project Profile application for an EIA Study Brief. Nicci is responsible to offer a constraint mapping service for the site selection stage. It is achieved through the use of GIS software through the collation of layers of mapped information showing features, constraints and engineering or planning proposals, to produce a multi-layered constraint map which forms the basis for the identification of unconstrained areas and thereby feasible sites for the FSRU locations.

Coral Mapping for Sarawak Shell Berhad, Malaysia (2014).
GIS Specialist
To obtain survey results from surveyors and create a database for the survey and analysed results; and finally deliver a series of coral maps of the surveyed areas. Nicci is responsible to consolidate and normalize the survey data, apply different interpolation methods to interpolate the coral distributions in order to create coral mapping.

Coral Mapping for Brunei Shell Petroleum, Brunei (2014).
GIS Specialist
To obtain survey results from surveyors and create a database for the survey and analysed results; and finally deliver a series of coral maps of the surveyed areas. Nicci is responsible to consolidate and normalize the survey data, apply different interpolation methods to interpolate the coral distributions in order to create coral mapping.

Biodiversity Consultancy Services for the Si Hong 100MW Photovoltaic Power Project, CLP, China (2013).
GIS Specialist
An Ecological Baseline Survey to verify the wetland habitat condition and wildlife utilization (especially avian fauna) at the project site and its vicinity. Measures based on the site conditions and potential ecological impacts are recommended. Nicci is responsible to prepare survey maps and process the survey data and deliver a series of maps for reports.

Ecological Survey for Proposed Muk Wu Sewage Treatment Plant - North District Sewerage Stage 2 (Remainder) and Sewerage to Chuen Lung, Kau Wa Keng Old Village and Lo Wai – Investigation, Design and Construction, Hong Kong (2013)
GIS Specialist
A baseline ecological survey is needed for the construction of the proposed Muk Wu Sewage Treatment Plant. Nicci is responsible to prepare survey maps and process the survey data and deliver a series of maps for reports.

Tai Tam Harbour Environmental Consultancy Services, Confidential Client, Hong Kong (2011-2013)
GIS Specialist
Nicci is responsible to deliver series constraint maps of the Tai Tam Harbour site. She has to prepare comprehensive environmental, physical and land use planning constraints analysis for potential new cable systems landing in Hong Kong.

New Submarine Cable System in Junk Bay, CLP, Hong Kong (2011)
GIS Specialist
Nicci is responsible to deliver series constraint maps of the Junk Bay area. She has to prepare comprehensive environmental, physical and land use planning constraints analysis for potential new cable systems landing in Hong Kong.

Constraint Analysis for Asia Submarine-cable Express (ASE) – Tseung Kwan O, NTT Com Asia, Hong Kong (2010-2011)
GIS Specialist
Nicci is responsible to offer a constraint mapping service for the route and landing point planning exercise. It is achieved through the use of GIS software through the collation of layers of mapped information showing features, constraints and engineering or planning proposals, to produce a multi-layered constraint map which forms the basis for the identification of unconstrained areas and thereby feasible route.

GIS in Web Service

Enhanced Map Archived Retrieval Systems (EMARS), Lands Department, Hong Kong (2010-2011)
Assistant Cartographer
The Enhanced Map Archived Retrieval Systems (EMARS) is an enhancement of the current HKMS at Lands Department; with the enhancement service, it aims to provide both digital and paper map sales online service. Nicci plays a role as a project coordinator to get user requirements and prepares documents to get quotation from contractors. She is also responsible to work on the feasibility study on the enhancement features in the new system.

Hong Kong Map Services (HKMS), Lands Department, Hong Kong (2009-2010)
Assistant Cartographer
The Hong Kong Map Service (HKMS) is a system providing round-the-clock service for e-ordering, e-payment and e-delivery of digital map products to the public as well as Government Bureau/Department. Nicci is responsible for testing, checking, and comment on the final stage of the HKMS with contractor. She plays a role as a project coordinator to fine tune the final product and deliver to users. Nicci is also responsible to communicate with other government departments, private companies to promote the new online map sales service.

GIS in Construction & Engineering

Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) Preliminary Design, Hong Kong, MTR Corporation (2008)
GIS Programmer
The Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) is to provide high speed rail services from Hong Kong to Guangzhou and a connection to the national high-speed passenger rail network serving major mainland cities outside Guangdong province. Nicci is responsible to process the aerial images, work with geologists to process rock head contour data, station information and other land information in order to create 3D models and flythrough videos to demonstrate the landscape and the structure of the station of West Kowloon Terminus. GIS and programming skills such as 3D analysis, spatial analysis, and ArcGIS tools customization techniques are also applied throughout the project.

Shatin-to-Central Link (Hung Hom to Admiralty Section and Wong Tai Sin Section) Design Phase, MTR Corporation, Hong Kong (2008)
GIS Programmer
The Shatin to Central Link (SCL) is a strategic railway line that stretches from Tai Wai to Admiralty, connecting several existing railway lines and passing through multiple districts in Hong Kong, and it will serve areas in East Kowloon that currently do not have any MTR service. Nicci is responsible to process the aerial images, work with geologists to process rock head contour data, pile information and other land information in order to create 3D models and flythrough videos to demonstrate the overview of the landscape and designated rail elevations for the selected construction sites. GIS and programming skills such as 3D analysis, spatial analysis, and ArcGIS tools customization techniques are also applied throughout the project.

South Island Line (East) Preliminary Design, MTR Corporation, Hong Kong (2008)
GIS Programmer
The South Island Line (East) is responded to longstanding calls from the Southern District residents for improved and alternative transport services. Nicci is responsible to process the aerial images, work with geologists to process rock head contour data, station information and other land information in order to create 3D models and flythrough videos to demonstrate the overview of the landscape and structure of the proposed station in the Admiralty and Wanchai area. GIS and programming skills such as 3D analysis, spatial analysis, and ArcGIS tools customization techniques are also applied throughout the project.

Mubadala – South Hydayriat Islands, Abu Dhabi – Project Management – Design Phase, Abu Dhabi Urban Planning Council, United Arab Emirates, Abu Dhabi (2008)
GIS Programmer
Abu Dhabi is planned to develop another island off the coast; it is to make the capital a city of islands connected by dozens of bridges and tunnels. Nicci is responsible to manipulate the Lidar and bathymetric data from the Contractor in order to perform 3D and spatial analysis, meanwhile she has to process the aerial photos and CAD drawing data with the purpose of to create 3D models and flythrough videos to demonstrate the overview of the selected development

site, the before reclamation and dredging scenario, and the completed construction scenario. Volume change calculation is also conducted for island reclamations and channel dredging.

HKHA Agreement No.: CB20070002 – Term Geotechnical Consultancy for Natural Terrain Hazard Study, CEDD, Hong Kong (2007 – 2009)
GIS Programmer
Nicci is responsible for data manipulation in order to create 3D models for perform analysis of the study area of Mt. Davis presentation. She is also responsible to produce fly through videos and maps to demonstrate the outputs for public consultation.

Agreement No. CE 9/2007 (GE) – Natural Terrain Hazard Mitigation Works at North Lantau Expressway & Yu Tung Road Near Tung Chung Eastern Interchange – Design & Construction, CEDD, Hong Kong (2008)
GIS Programmer
Nicci is responsible to ortho-rectified and georeference images for map displaying and 3D models. Process survey data and topo-map data in order to generate 3D model and calculate volume change of the before landslide and after landslide circumstances. She is also responsible to produce maps to demonstrate the outputs.

Agreement No. CE 41/2007 (GE) – Study of Landslides Occurring in Kowloon and the New Territories in 2008 and 2009 – Feasibility Study, CEDD, Hong Kong (2008)
GIS Programmer
Nicci is responsible to process Lidar and survey data in order to generate 3D models and calculate volume change for before landslide and after landslide. She is also responsible to produce maps to demonstrate the outputs.

GIS and Remote Sensing

Study of Major Industrial Air Pollution Sources in the Pearl River Delta Region – Design Phase, China (2008)
GIS Programmer
Nicci is responsible to data searching on China provincial boundary, georeferencing maps, and image processing for the Guangdong region by applying photogrammetry techniques in order to generate maps to demonstrate the pollutant concentrations for the designated areas.

GIS in Transportation

Transport Information System (TIS), GLD Contract No.:C0162/2006, Hong Kong, Transport Department (2007-(2007-2008)
GIS CAD Draftsman
The Transport Information System (TIS) is a centralized data warehouse for the collection, processing and dissemination of comprehensive traffic and transport information using Geographical Information Systems (GIS) platform. TIS is a value added system, it provides functions such as driving route search, car navigation, fleet management, public transport enquiry and other intelligent system services.
Nicci was initially responsible on data conversion, data cleansing, and data manipulation where the data is acquired from different parties.
She was then participated in the Intelligent Road Network (IRN) package design implementation and problem solving after the data conversion phase is done. Tasks in this stage include maintain data consistence when transferring data to the sub-contractor and during data submission to the Transport Department. Meanwhile, she is also responsible on the IRN data accuracy and maintenance for all stages.
Other than applying technical skills, Nicci meets up with the sub-contractor to provide training on creating the IRN package dataset, where the IRN package includes typical features such as road segments, turning movements at road junctions, traffic directions, stopping restrictions, speed limit, parking locations, and etc. Other data in the IRN packages include public transport routes, schedule of services, stops, and traffic statistical data. She also provides QA/QC for the returned data from the sub-contractor.
Besides deals with the sub-contractor, she was scheduled to have regular meetings with Transport Department staffs to discuss the data requirement and project progress, and therefore to preserve the data quality.

CURRICULAM VITAE OF SOE MIN

PERSONNEL DATA

NAME : U Soe Min

POSITION : Director
Civil and Water Resources Engineering
Environmental Technology & Management

CURRENT WORKPLACE : E Guard Environmental Services Co., Ltd.

EDUCATION : B.E. (Civil), RIT, Yangon.
M.E. (Environmental Technology & Management), AIT, Bankok.

EDUCATION

- **2014 July , 21-23** Internal EMS Auditor Training ISO 14001:2004, EQS Asia Pte Ltd., Singapore.
- **2001 Nov, 5-9** MTERM (Modeling Tools for Environmental and Resource Management) Workshop on Modelling of Wastewater Treatment Plants sponsored by Danish International Development Assistance at Asian Institute of Technology, Bangkok, Thailand. (Certificate)
- **2000 Jan – 2001 Aug** M.E (Environmental Technology & Management), Asian Institute of Technology, Bangkok, Thailand.
- **1992 Feb–Nov** Irrigation and Drainage Engineering Training Course II (Certificate), Tsukuba Int'l Agr. Training Center Tsukuba, Japan
- **1980–1984** B.E. (Civil), Rangon Institute of Technology, Yangon, Myanmar.

WORK EXPERIENCES

2013 June – Todate E Guard Environmental Services Co., Ltd.

Director (Civil, Water Resources & Environmental Engineering)

- Team Leader, Environmental Quality Survey & Montoring for ESIA projects and Environmental Planning and Management Programs.
- EIA Team Member
- Specialist in providing solutions for water and environmental data acquisition systems
- Speaker and coordinator of ESIA's stakeholder meetings and public consultations meetings

2007 Jan – 2013 April Myanmar GreenTech Co., Ltd.

Director

- Responsible for business developments of the company
- Provide sales with solutions for water and environmental data acquisition systems
- Local representative of monitoring and data acquisition instruments (YSI, Global Water, RTS)

2006 Jan – 2013 Fev SK-Lynx Pte Ltd., Singapore.

Managing Director

- Responsible for business developments of the company.

2005 Jul – 2007 Nov AVA Consultancy and Engineering Co., Ltd.

Director, Water Resources and Environmental Engineering

Responsible for business development of the company

- Coordinate the water resoruces and environmental engineering projects, provide solutions for environmental data acquisition systems

2002 Aug – 2005 Jul Environmental Landscape Pte Ltd. Singapore.

Water Feature Specialist

Responsible for design, build, and maintain water treatment system, water features, pools and ponds, irrigation systems, etc. for private and public facilities in Singapore..

2001 Aug – 2002 May Water Engineering & Management, School of Civil Engineering, Asian Institute of Technology, Bangkok, Thailand.

Research Associate

- Responsible as *a project coordinator* for coordinating the research projects
- Impact assessment on water quality of a raw water source for the water treatment plants – by Mike 11 Modelling for the proposed design of the covering structure and other design alternatives.

2000 Jan – 2001 Aug Environmental Technology and Management, School of Environment, Resources and Development, Asian Institute of Technology, Bangkok, Thailand.

M. Eng. Student

- Thesis: "Water Quality Modelling of Canal Prapa" [Grade - Excellent]

1997 Dec –1999 Jun Seatec Int'l Consulting Eng. Co., Ltd. Bangkok, Thailand

Civil/Water Resources Engineer

- Engineering design, report/proposal preparations, project supporting and business development for local and regional projects.
- Study of surface water quality and source sufficiency for the feasibility assessment of Bangkok's Aquifer Storage Recovery Project..
- Assistant to the team leader in preparation of EIA guidelines for the Environmental Strengthening Project in Cambodia and proposal for Strategic Environment Framework for the GMS (ADB - TA No. 5783)

1995 June –1997 Nov Aloha Consulting Eng. Co., Ltd., Bangkok, Thailand

Civil/Water Resources Engineer

- Detail design of dam and outlet works, water supply distribution system
- Quantity estimation and preparation of contract documents.
- Irrigation distribution system design and cost estimation of pumping stations

1993–1995 May Irrigation Dept, Ministry of Agriculture, Yangon, Myanmar

Section Head, Counterpart of JICA expert, Design Criteria Section

- Worked for the adaptation of design criteria for the implementation of future water resource development projects by the irrigation department incoorpeartion with technical assistant from JICA. The criteria preparation included *Design of Fill Dams, Canal Designs and Head Works Design.*
- Arranged, conducted and attended several technical transfer training courses concerning hydraulic, hydrology, modeling, material testing(soil and concrete), water quality and sponsored by JICA.

1992 Feb–Nov Tsukuba Int'l Agricultural Training Center Tsukuba, Japan Irrigation and Drainage Engineering Training Course II

Participant

- Official Study Tour and Training Program on the water resources development projects in Japan

1989–1992 Irrigation Dept., Ministry of Agriculture, Bago, Myanmar

Assistant Engineer, Data Bank and Data Analyst Section

- Collection and analysis of hydro-meteorology data.
- Establishment of program library and database management system for water resource development projects.
- Preparation of technical calculation programs.

1986–1989 Irrigation Dept., MOA, Prome, Myanmar
Assistant Engineer, South Nawin Irrigation Project

- Design of irrigation canal and related structures.
- Supervision of earthfill dam and appurtenant structure construction.

1984–1985 Construction Corporation, Ministry of Construction, Bago, Myanmar
Assistant Engineer, Construction Industry Project

- Construction material testing and quality control of Highway Road Construction Project
- Construction supervision of Provincial Road expansion work.

LANGUAGES

Burmese (Mother tongue)

English (Fair: writing and speaking; Good: reading, and listening)

Thai (communicable speaking - greetings, eating, general talks; able to read out Thai names)

Japanese (Some spoken formal greetings)

E Guard Environmental Services Co., Ltd.
No. 99, MyaKanThar Lane, NyeinChanYay Street, 10 Miles, Pyay Road,
Saw Bwar Gyi Gone, Insein Township, Yangon 11011, Myanmar.
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Skype: eguardenvironmental, Email: Web Site: Facebook Page: Twitter

Curriculum Vitae

Personal data

Name	Myat Mon Swe
Contact Address/ Email	No.Ma-20, Neik Bain Da Street, Nanthargone Qr., Insein Township, Yangon, Myanmar Email: myatmonswe@eguardservices.com, myatmonswe@gmail.com
Contact Number	+95-9-797005166, +95-9-420111902
Nationality	Myanmar
Sex	Female

Language Proficiency	Myanmar - Native Speaker English - Speaking (Good), Writing (Good), Listening (Good), Reading (Good) German - Speaking (Good), Writing (Good), Listening (Good), Reading (Good)

Educational qualifications

Diploma in Geographical Information System	January 2006 to September 2006 Yangon University, Yangon, Myanmar
Master of Engineering-Energy and Environmental Management	October 1996 to June 1998 University of Flensburg, Germany
Bachelor of Agriculture	June 1984 to March 1987 Yezin Agricultural University,Yezin, Myanmar
Diploma of Science	June 1982 to March 1983 Yangon University, Hlaing Campus, Yangon, Myanmar

Employment records

Position:	Senior Consultant
Period:	Strated from 15 May 2014 – upto now
Place:	Eguard Environmental Services Co., Ltd, Yangon, Myanmar

Position:	Consultant / Project Manager
Period:	Dec 2013 - April 2014
Place:	IMCM, Institute of Management Consultant Myanmar, Yangon, Myanmar

Position:	Consultant
Period:	August 2010 to November 2013
Place:	Golden Key Co., Ltd, Yangon, Myanmar

Position:	Consultant
Period:	Jan 2010 to Julyl 2010
Place:	Rupa Dagon Co., Ltd, Yangon, Myanmar

Position:	Deputy Staff Officer to Assistant Manager
Period:	March 1994 to December 2009
Place:	Ministry of Agriculture and Irrigation, Yangon, Myanmar

Position:	Secretary
Period:	March 1992 to January 1993
Place:	Shaws and Brother Co., Ltd, (Singapore), IBC, Yangon, Myanmar

Position:	Daily Wages to Laboratory Assistant
Period:	May1987 to January 1992
Place:	Agricultural Research and Development, Ministry of Agriculture and Irrigation, Gyogone, Myanmar

Work undertaken/ tasks assignment

Name of assignment or project	2D Marine Seismic Survey for Offshore Block A-7
Year:	2016 (on going)
Location:	Ayeyarwaddy Region
Client:	Woodside Energy (Myanmar) Pte., Ltd, and AECOM (MALAYSIA)
	Initial Environmental Examination (IEE)
Main project features:	Local Consultant
Position held:	Public Consultation, Fishing Survey, Team Leader of Community Leison Officers- CLO/Grievance-
Activities performed:	Mechanism

Name of assignment or project	Driling (Thalin-1) for Offshore Block AD-7
Year:	2016 (on going)
Location:	Rakhine State
Client:	Woodside Energy (Myanmar) Pte., Ltd and ERM (HK)
Main project features:	Initial Environmental Examination (IEE)
Position held:	Local Consultant
Activities performed:	Public Consultation and Fishing Survey

Name of assignment or project	Marine Seismic Survey for Offshore Block AD-7
Year:	2016 (on going)
Location:	Rakhine State
Client:	Woodside Energy (Myanmar) Pte., Ltd, and ERM (HK)
Main project features:	Initial Environmental Examination (IEE)
Position held:	Local Consultant
Activities performed:	Public Consultation and Fishing Survey

Name of assignment or project	3D Marine Seismic Survey for Offshore Block A-7
Year:	2016 (on going)
Location:	Ayeyarwaddy Region
Client:	Woodside Energy (Myanmar) Pte., Ltd, and AECOM (MALAYSIA)
	Initial Environmental Examination (IEE)
Main project features:	Local Consultant
Position held:	Public Consultation, Fishing Survey, Team Leader of Community Leison Officers- CLO/Grievance-
Activities performed:	Mechanism

Name of assignment or project	Amazing Ngapali Resort
Year:	2016 (on going)
Location:	Thandwe, Rakhine State
Client:	Advanture Myanmar Tours & Incentives Company Limited
Main project features:	Environmental Management Plan (EMP)
Position held:	Local Consultant
Activities performed:	Team Leader

Name of assignment or project	3D Marine Seismic Survey for Offshore Block AD-5
Year:	2015
Location:	Ayeyarwaddy Region
Client:	Woodside Energy (Myanmar) Pte., Ltd, and AECOM (MALAYSIA)
	Initial Environmental Examination (IEE)
Main project features:	Local Consultant
Position held:	Public Consultation, Fishing Survey, Team Leader of Community Leison Officers- CLO/Grievance-
Activities performed:	Mechanism

Name of assignment or project	3D Driling (Shwe Yi Tun -1) for Offshore Block A-6
Year:	2015
Location:	Ayeyarwaddy Region
Client:	Woodside Energy (Myanmar) Pte., Ltd, AECOM (MALAYSIA)
Main project features:	Initial Environmental Examination (IEE)
Position held:	Local Consultant
Activities performed:	Public Consultation

Name of assignment or project	National Power Transmission Network Project (500kV)
Year:	2015
Location:	Yangon, Bago, Taungoo, Meiktilar
Client:	Ministry of Electric Power Enterprise (MEPE), JICA, ERM (Japan)
Main project features:	Initial Environmental Examination (IEE)
Position held:	Local consultant
Activities performed:	Public Consultation, Biodiversity and Social Survey

Name of assignment or project	National Power Transmission Network Project (500kV)
Year:	2015
Location:	Yangon, Bago, Taungoo, Meiktilar
Client:	Ministry of Electric Power Enterprise (MEPE), JICA (ERM (Japan)
Main project features:	Land Acquisition anf Resettlement Action Plan (RAP)
Position held:	Local consultant
Activities performed:	Public Consultation and Social Survey

Name of assignment or project	Preparatory Survey on Thilawa SEZ Development Project (2000Ha)
Year:	2015
Location:	Thilawa, Thanlyin Township
Client:	Thilawa SEZ Management Committee, JICA (ERM (Japan)
Main project features:	Strategic Environmental Assessment (SEA)
Position held:	Local consultant
Activities performed:	Public Consultation, Environmental Quality Analysis, Biodiversity Survey , Traffic Survey and Social Survey

Name of assignment or project	Preparatory Survey on Thilawa SEZ Development Project (2000Ha)
Year:	2015
Location:	Thilawa, Thanlyin Township
Client:	Thilawa SEZ Management Committee and JICA (ERM (Japan)
Main project features:	Environmental Impacts Assessment (EIA) for the whole area of 2000Ha
Position held:	Local consultant
Activities performed:	Public Consultation, Environmental Quality Analysis, Biodiversity Survey , Traffic Survey and Social Survey

Name of assignment or project	Thingaha (Ngapali) Hotel
Year:	2015
Location:	Thandwe, Rakhine State
Client:	Eden Hotels and Resorts Co., Ltd.
Main project features:	Environmental Management Plan (EMP)
Position held:	Consultant
Activities performed:	Team Leader

Name of assignment or project	Manufacturing of the Varieties of Shoes Factory
Year:	2014
Location:	Thardukan Industrial Park, Yangon
Client:	Myanmar Pou Chen Co., Ltd.
Main project features:	Initial Environmental Examination (IEE)
Position held:	Consultant
Activities performed:	Team Leader

Name of assignment or project	No-5 Sugar Mill (Myohla)
Year:	2014
Location:	Myohla
Client:	Internatiional Gateways Group of Co., Ltd.
Main project features:	Environmental Management Plan (EMP)
Position held:	Consultant
Activities performed:	Team Leader

Attended trainings and workshops

First Aid Training	29th December 2015 to 31st December 2015
WHAT, WHY, WHO, WHEN AND HOW SIA, Resettlement Planning, Livelihood Restoration & Stakeholder Enguagement Workshop	23rd November 2015 to 27th November 2015 Kent, United Kingdom
OH&S Management System Standard Awareness Course (OHSAS 18001:2007)	9th August, 2015 WIN OSHE SAFETY ACADEMY, Yangon, Myanmar
Summer School on Solar Applications for Rural Development	31st May 2011 to 6th June 2011 Albert-Ludwigs Universität Freiburg, Germany
"Double Your Customers and Profit", Brian Tracy Training	5th November 2012 Bangkok, Thailand
South Asian Regional Workshop on Renewable Energy for Sustainable Development	19th May 2008 to 23rd May 2008 Flensburg Association for Energy Management-Nepal (FAME-Nepal), Kathmandu and Pokhara, Nepal
Summer School on "Photovoltaic – Scientific and Technical Potential for Developing Countries"	27th August 2006 to 10th September 2006 Techniche Universität Bergakademie Freiberg, Germany
e Government Workshop Training Course	19th September 2005 to 28th October 2005 Telecommunication and Postal Training Centre, Yangon, Myanmar Ministry of Communications, Post and Telecommunication, Yangon, Myanmar
Certificate of Adult Core English	21st July 2005 to 31st August 2005 The American Center, Yangon, Myanmar
Certificate of Training Course on GMS Rural Renewable Energy	3rd July 2005 to 17th July 2005 Foreign Economic Cooperation Center, Ministry of Agriculture, Beijine, China
Certificate of Network Security Management	8th August 2005 to 19th August 2005 Center of the International Cooperation for Computerization and Myanmar Computer Federation
Certificate of English Language Proficiency Course	1st June 2004 to 20th August 2004 EUROPA- International Education Academy, Yangon,Myanmar
Certificate of Training Workshop on Policy Analysis	13th May 2004 to 18th May 2004 Department of Agricultural Planning, Ministry of Agriculture and Irrigation, Yangon, Myanmar
Multidisciplinary German – Myanmar Workshop on Sustainability in Rural amd Urban Environments	17th November 2003 to 21st November 2003 Yangon University, Yangon, Myanmar
Certificate of Intermediate Course on GIS	13th January 2003 to 17th January 2003 MCC- MASTECH, Yangon, Myanmar
Certificate of Office Database Application	6th November 2002 to 2nd January 2003 Ministry of Agriculture and Irrigation, Yangon, Myanmar
Certificate on Basic GIS Training Course (JICA)	13th November 2002 to 22nd November 2002 MCC- MASTECH, Yangon, Myanmar

Research Fellowing Summer Semaster (1/4/-19/7/2002)	1st March 2002 to 31st May 2002 University of Flensburg, Germany
GIS Introduction and Workshop	3rd April 2000 to 7th April 2000 Myanmar Intergraph, IBC, Yangon, Myanmar
Certificate of Gernan Language	April 1996 to September 1996 University of Flensburg, Germany
Certificate of Computer Application	1st Jaunary 1996 to 1st March 1996 University of Computer Science, Yangon, Myanmar
Certificate of German Language	September 1995 to December 1995 University of Foreign Languages (Yangon)
Certificate of Secretarial Studies	1st August 1992 to 30th November 1992 ACE Data System, Yangon, Myanmar

Other qualifications and social activities

Study on Spatial Pattern of GIS on Health Facilities in Rakhine State	Ministry of Health, 2006
Solar Pumping System Installation for Sustainable Energy Development Program (JICA)	Meiktilar Hospital, 1999
Solar Farm for Sustaibnable Development	Changmagyi Cotton Model Farm, 1998
Traditional Cook-Stove Development Project (JICA)	Dry Zone, 1997

Annex 3.1 Woodside Corporate Policies

Woodside Health, Safety, Environmental and Quality Policy

WOODSIDE POLICY

Health, Safety, Environment and Quality Policy

OBJECTIVES

Strong health, safety, environment and quality (HSEQ) performance is essential for the success and growth of our business. Our aim is to be recognised as an industry leader in HSEQ through managing our activities in a sustainable manner with respect to our workforce, our communities and the environment.

At Woodside we believe that process and personal safety related incidents, and occupational illnesses, are preventable. We are committed to managing our activities to minimise adverse health, safety or environmental impacts, incorporating a right first time approach to quality.

PRINCIPLES

Woodside will achieve this by:

- implementing a systematic approach to HSEQ risk management
- complying with relevant laws and regulations and applying responsible standards where laws do not exist
- setting, measuring and reviewing objectives and targets that will drive continuous improvement in HSEQ performance
- embedding HSEQ considerations in our business planning and decision making processes
- integrating HSEQ requirements when designing, purchasing, constructing and modifying equipment and facilities
- maintaining a culture in which everybody is aware of their HSEQ obligations and feels empowered to speak up and intervene on HSEQ issues
- undertaking and supporting research to improve our understanding of HSEQ and using science to support impact assessments and evidence based decision making
- taking a collaborative and pro-active approach with our stakeholders
- requiring contractors to comply with our HSEQ expectations in a mutually beneficial manner
- publicly reporting on HSEQ performance

APPLICATION

Responsibility for the application of this policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this policy in non-operated joint ventures.

This policy will be reviewed regularly and updated as required.

December 2015

Woodside Sustainable Communities Policy

Sustainable Communities Policy

OBJECTIVE

Woodside seeks to build long-lasting relationships with the communities in which we are active and to demonstrate respect for the culture and values of our host communities.

PRINCIPLES

We will achieve this by:

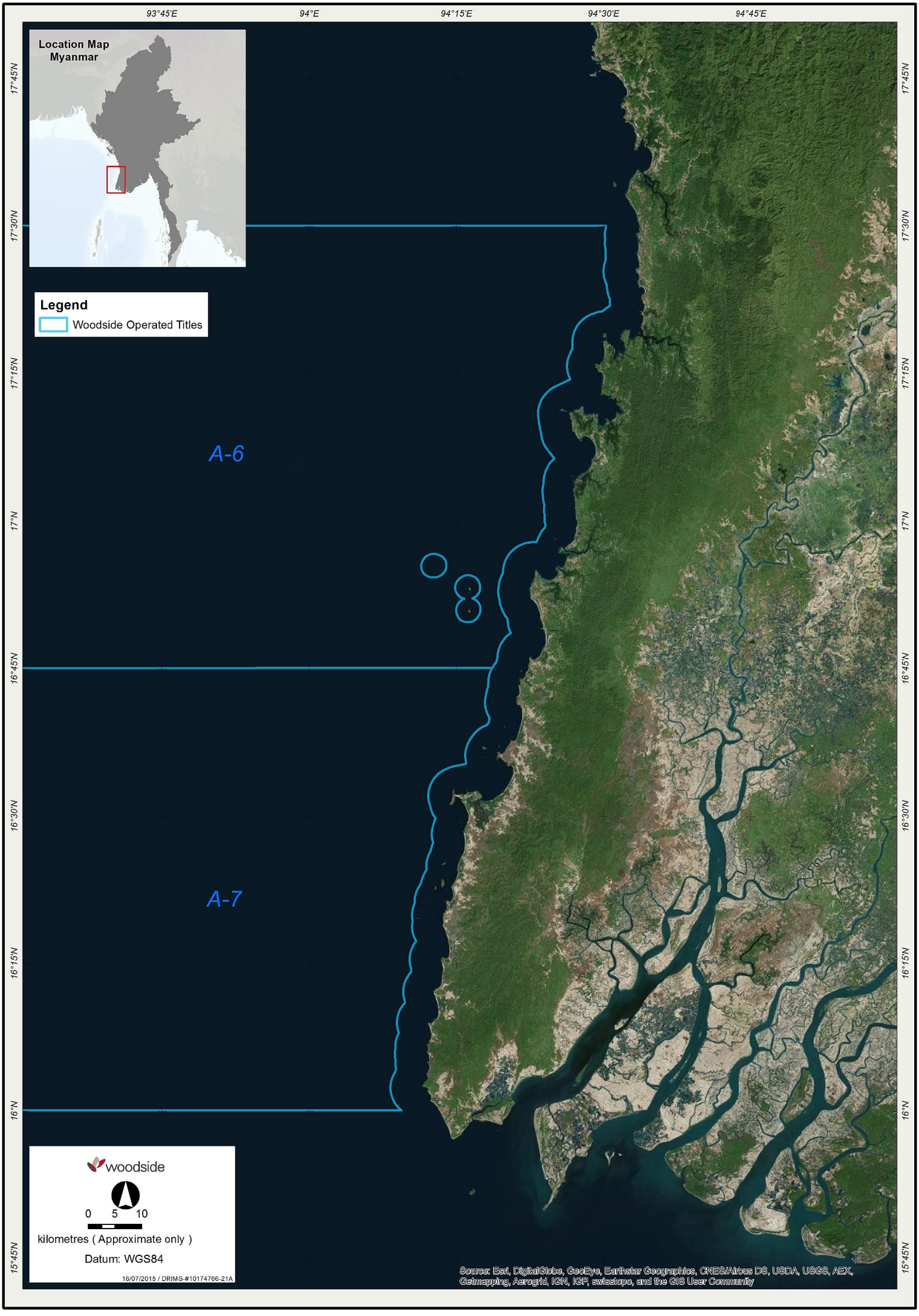
- Proactively engaging with our stakeholders
- Understanding and managing the social impacts and opportunities associated with our activities
- Contributing to host communities in ways that are of mutual benefit to Woodside and the community
- Delivering on our commitments to build community capacity and capability
- Communicating our progress and performance with stakeholders and host communities

APPLICATION

Responsibility for the application of this policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this policy in non-operated joint ventures.

December 2014

Annex 5.1 Satellite Imagery of Block A-6


93°45'E
94°E
94°15'E
94°30'E
94°45'E
17°45'N
17°30'N
17°15'N
17°N
16°45'N
16°30'N
16°15'N
16°N
15°45'N
Location Map
Myanmar
Legend
Woodside Operated Titles
A-6
A-7
woodside
0 5 10
kilometres (Approximate only)
Datum: WGS84
16/07/2015 / DRIMS-#10174766-21A
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Annex 5.2 Pelagic Fish Species Present in Waters of the Rakhine Coastal Region

Latin name	Common Name	IUCN Status*
ALOPIIDAE	**Lamniform sharks**	
Alopias pelagicus	Pelagic thresher	Vulnerable
CARANGIDAE	**Jacks**	
Carangoides malabaricus	Malabar trevally	Not yet assessed
Decapterus sp.	Scads / mackerel scads / horse mackerel	-
Megalaspis cordyla	Torpedo scad	Not yet assessed
Selar crumenophthalmus	Bigeye scad	Least Concern
CARCHARHINIDAE	**Requiem sharks**	
Carcharhinus longimanus	Oceanic Whitetip Shark	Vulnerable
CLUPEIDAE	**Herring/Shad/Sardine**	
Anodontostoma chacunda	Chacunda gizzard shad	Not yet assessed
Dussmieria acuta	Rainbow sardine	Not yet assessed
Encrasicholina heteroloba	Shorthead anchovy	Not yet assessed
Hilsa ilisha	Elongate ilisha	Not yet assessed
Opisthopterus tardoore	Tardoore	Not yet assessed
Sardinella gibbosa	Gold stripe sardinella	Not yet assessed
Tenualosa ilisha	Hilsa shad	Least Concern
ENGRAULIDAE	**Anchovy**	
Stolephorus indicus	Indian anchovy	Not yet assessed
EXOCOETIDAE	**Flying Fish**	
Exocoetidae sp.	Flying fish	-
ISTIOPHORIDAE	**Marlin**	
Istiophorus platypterus	Sailfish	Least concern
Tetrapturus audax	Striped marlin	Not yet assessed
GEMPYLIDAE	**Snake mackerels or escolars**	
Gempylus serpens	Snake mackerel	Least concern
Lepidocybium flavobrunneum	Escolar	Least concern
LATIDAE	**Perch**	
Lates calcarifer	Barramundi	Not yet assessed
LEIOGNATHIDAE	**Ponyfish**	
Gazza minuta	Toothed ponyfish	Least Concern
MYCTOPHIDAE	**Lantern fish**	
Benthosema fibulatum	Spinycheek lantern fish	Not yet assessed
NEMIPTERIDAE	**Threadfin breams**	
Nemipterus japonicus	Japanese threadfin bream	Not yet assessed
PRIACANTHIDAE	**Bigeyes**	
Priacanthus hamrur	Lunar-tailed bigeye	Not yet assessed
SCOMBRIDAE	**Mackerels**	
Katsuwonus pelamis	Stripped tuna (skipjack)	Least Concern

Latin name	Common Name	IUCN Status*
Rastrelliger brachysoma	short bodied mackerel	Data Deficient
Rastrelliger kanagurta	Indian mackerel	Data Deficient
Scomberomorus guttatus	Indo-pacific Spanish mackerel	Data Deficient
Scomberomorus lineolatus	Streaked Spanish mackerel	Least Concern
Scomberomorus commerson	Narrow barred Spanish mackerel	Near Threatened
Scomberomorus maculatus	Spanish mackerel	Least Concern
Thunnus albacares	Yellowfin tuna	Near threatened
SYNODONTIDAE	**Lizardfishes**	
Saurida tumbil	Greater lizardfish	Not yet assessed
TRICHIURIDAE	**Hair tail / Ribbon fish**	
Lepturacanthus savala	Savalai hairtail	Not yet assessed
Trichiurus lepturus	Largehead hairtial	Not yet assessed
XIPHIIDAE	**Swordfish**	
Xiphias gladius	Swordfish	Least concern

* The IUCN Red List of Threatened Species. Version 2015-4 ("IUCN 2015 Red List") **www.iucnredlist.org**

Annex 7.1 Consultation Records

Public Consultation				
Shwe Thaung Yan Township, Ayeyarwaddy Region				
Government Department (20)				
No	**Date**	**Name**	**Department**	**Occupation**
1	14.6.2016	U Min Min Oo	GAD	Township Administrative Officer
2	14.6.2016	U San Win	Fishery	Staff Officer
3	14.6.2016	U Tay Zar Aung	GAD	Administrative Officer
4	14.6.2016	U Sone Mhine	Fishery	Deputy Director
5	14.6.2016	U Mynt Swe	Fishery	Deputy Director General
6	14.6.2016	U Kyaw Zaya	MOGE	Deputy Director General
7	14.6.2016	Daw Tin Tin Mya	Myanmar Woman Association	-
8	14.6.2016	Daw Ohwn Mar Lwin	Myanmar Woman Association	-
9	14.6.2016	Daw Mhay Kyi	Myanmar Woman Association	-
10	14.6.2016	Daw Yin Yin Htay	Myanmar Woman Association	-
11	14.6.2016	Daw Po Po	Myanmar Woman Association	-
12	14.6.2016	Daw Ohwn Sint	Myanmar Woman Association	-
13	14.6.2016	Daw Mu Mu San	Myanmar Woman Association	-
14	14.6.2016	Daw Khin Htar Hlaing	Myanmar Woman Association	-

Local People (46)					
No	**Date**	**Name**	**Occupation**		**Place**
1	14.6.2016	Maung Tha Kal	Fisherman		Chaung Thar
2	14.6.2016	U Sein Ngwe	Fisherman		Chaung Thar
3	14.6.2016	U Win Myint	Fisherman		Chaung Thar
4	14.6.2016	U Aung Lay	Fisherman		Chaung Thar
5	14.6.2016	U Ko Naing	Fisherman		Chaung Thar
6	14.6.2016	U Kyaw Thu Ya	Fisherman		Chaung Thar
7	14.6.2016	U Yan Naing Soe	Fisherman		Tha Bock Kan
8	14.6.2016	U Kyaw Htay	Fisherman		Tha Bock Kan
9	14.6.2016	U Maung Maung Myint	Fisherman		Tha Bock Kan
10	14.6.2016	U Min Min	Fisherman		Chaung Thar
11	14.6.2016	U Yin Hla	Fisherman		Chaung Thar
12	14.6.2016	U Tun Myint	Fisherman		Chaung Thar
13	14.6.2016	U Aung Ko Win	Fisherman		Chaung Thar
14	14.6.2016	U Zaw Htike	Fisherman		Wout Thay
15	14.6.2016	U Tin Htay	Fisherman		Wout Thay
16	14.6.2016	Daw Thi Thi Khaing	Fisherman		Wout Thay
17	14.6.2016	U Kyaw Zin Lwin	Fisherman		Wout Thay
18	14.6.2016	U Tin Aye	Fisherman		Wout Thay
19	14.6.2016	U Tun Zaw	Fisherman		Chaung Thar
20	14.6.2016	U Win Tin	Fisherman		Chaung Thar
21	14.6.2016	U Soe Lwin Oo	Fisherman		Chaung Thar
22	14.6.2016	Daw Aye Aye Tun	Fisherman		Chaung Thar
23	14.6.2016	U Ohwn Htay	Fisherman		Tha Bock Kan
24	14.6.2016	U Kyi Khaing	Fisherman		Tha Bock Kan
25	14.6.2016	U Myo Nyunt	Fisherman		Tha Bock Kan
26	14.6.2016	Ko Soe Soe	Fisherman		Chaung Thar
27	14.6.2016	Ko Myint Aye	Fisherman		Shwe Thaung Yan
28	14.6.2016	U Toe Myint	Fisherman		Shwe Thaung Yan
29	14.6.2016	U Aung Toe	Fisherman		Shwe Thaung Yan
30	14.6.2016	U Hla Htay	Fisherman		Shwe Thaung Yan
31	14.6.2016	U Aye Lwin	Fisherman		Shwe Thaung Yan
32	14.6.2016	U Maung	Fisherman		Shwe Thaung Yan
33	14.6.2016	U Sein Kyaw Htay	Fisherman		Wout Thay
34	14.6.2016	U Maung Maung	Fisherman		Wout Thay
35	14.6.2016	U Myo Nyein	Fisherman		Wout Thay
36	14.6.2016	U Zaw Htike	Fisherman		Wout Thay
37	14.6.2016	U Kyi Soe	Fisherman		Wout Thay
38	14.6.2016	U Hla Moe	Fisherman		Tha Bock Kan
39	14.6.2016	U Thant Zin	Fisherman		Tha Bock Kan
40	14.6.2016	Ma Yu Cho	Fisherman		Tha Bock Kan
41	14.6.2016	U Than Win	Fisherman		Chaung Thar
42	14.6.2016	Daw Khin Mar Kyaw	Fisherman		Chaung Thar
43	14.6.2016	U Soe Naiing	Fisherman		Khan Gyi
44	14.6.2016	U Han Htay	Fisherman		Khan Gyi
45	14.6.2016	U Aye Myaing	Fisherman		Khan Gyi
46	14.6.2016	U Thaung Htay	Fisherman		Aung Min Glar Kyun

Organization (3)				
No	**Date**	**Name**	**Occupation**	**Department**
1	14.6.2016	Daw Myat Mon Swe	Senior Consultant	E Guard
2	14.6.2016	Daw Soe Moe New	Project Assistant	E Guard
3	14.6.2016	U Htet Thiha Phone Myint	Project Assistant	E Guard

NGO(1)				
No	**Date**	**Name**	**Position**	**Department**
1	14.6.2016	U Phoe Kyaw	Charge	Ya.Da.Ka

Consultation Record of Department of Fisheries (DOF)

Basic details			
Project	Block A-6 Drilling, Rakhine Basin in Myanmar		
Office/ Department/ Organization	DOF Office	**Region/ State**	Ayeyarwaddy Region
District	Pathein	**Township**	Pathein
Village Tract (if applicable)	N/A	**Village (if applicable)**	N/A
Date and Time	13th June 2016, 3:00 PM to 4:00 PM		
Venue	Meeting room, DOF Office		
Remark	Meeting was held at DOF Office organized by Regional Director of DOF		
Purpose of the visit	Public consultation, information disclosure of the project activities		
Attendee	Government Officer (3)		
Agenda	1) Introduction by Mr. Daniel Clery, Country Manager, Woodside Energy (Myanmar) 2) Explanation about Drilling activities of Block-6 by U Kyaw Zayra, Deputy Director, MOGE and Daw Myat Mon Swe, Senior Consultant, E Guard Environmental Services Co., Ltd 3) Discussion Section 4) Thanks Remark by Mr. Daniel Clery, Country Manager, Woodside Energy (Myanmar)		
1) Introduction **2) Explanation**	***Mr. Daniel Clery, Country Manager of Woodside***: Due to the previous activities in Seismic Survey, we have done many activities in Ayeyarweddy region and Rakhine Basin in end of last year and early this year. In that time, the information about mammals was collected and we came here to explain about it. Woodside is biggest Oil and Gas Company in Australia and it has very experiences on offshore in many countries all over the world. Due to the working used to in the sea, the data of marine mammals are collected by research and working with related institutes. We found successfully gas potential in A-6 in Ayeyarweddy region (Shwe Yi Tun) and AD-7 (Thalin - 1A) in Rakhine State in last year. So that we have to try to drill more in this year to find the gas content in those areas again. The activities carried out of Woodside starts from acquire and exploration through to marketing, but only the first activities as seismic survey and exploratory drilling stage could be activated in Myanmar and the marking stage in other countries are being carried out. However, we hope that we can do all the activities of Woodside can be done in Myanmar. There are Woodside activities' in 6 Blocks in Myanmar, in which Woodside is a drilling operator in A-6 and MPRL cooperated as a government liaison. We completed seismic survey at blocks AD-5 and A-7 in Ayeyarweddy in last year and early this year, drilling at AD- 7 in Rakhine basin with Daewoo and another 2 Blocks AD-2 and A-4 with BG, which is an operator. In that time, the public consultations in affected villages along the coastal region were done. Then explained about the JV structure of Woodside Blocks in detail. Also we are emphasizing on the CSR programme as the cooperation with Flora and Fauna International to train the Marine Scientist at Pathein University, Early childhood programme by cooperating with Save the Children and Plan International in Therbaung Township. ***Ms. Lauranda Shaw, Senior Environmental Advisor, Woodside***: explained about the CSR activities at Marine Science Department of Pathein University; that Woodside trained with FFI the capacity building of the Marine Scientists for advanced knowledge such as Swimming and diving		

	skills by the arrangement of beach trip, baseline of survey of Seagrass, Coral and observation of birds' species, and problem solution of the impact on marine mammals. All reports of all information of this activities will be disclosed to the public. Also all activities of Woodside can be found on Woodside's Website as well. ***Daw Myat Mon Swe, Senior Consultant, EGuard Environmental Services Co., Ltd***: said that the Executive Summary of IEE reports in Myanmar language of 2D and 3D Seismic surveys were already disclosed at DOF in Pathein. Then, explained about the overview of A-7 and AD-5 Seismic Survey and CLO programme was done in A-7 activities. Due to the existing law, rule and EIA procedure, the public consultations were done in three levels as Union, Regional and Township levels for all previous Woodside's activities. For the current drilling activities for A-6, the consultation with relevant ministries as a national level was done and the current consultation activities with Chief Minister and regional government, related Departments, NGOs as MFF and Universities is for regional level and the holding Townhall meeting of tomorrow will be done as township level. At the Townhall meeting, all fishermen who are affected by project and related governmental officers will be invited to explain not only about the project activities but also about the expected impacts on environmental and social and its mitigation measure to reduce those impacts. The public consultations were done from Sinma village to Hyinegyi (10 villages) along the coastal area in Ayeyarweddy region were done as CLO programme for 2D Seismic Survey in Block A-7, which is only 15 NM far from coastal area. In this consultation, the cartoon and posters could be distributed to understand all the project activities to PAPs directly, which are already been in DOF of Pathein. Then, she explained the structure of Grievance Mechanism program how to cooperate with local authorities to receive the complaints and solve the problem. In that time, no interacting with local fishing boats and vessels and any compensation for the damage were not faced. Even A-6 is really far from the coastal area, the offshore fishermen of Thabotsate village in Dawei and Myeik in Thaninyaryi Region were consulted to inform the project activities as well because about 100 fishing boats from Thanintharyi region were found before activities by the permission of headquarter of DOF, every offshore fishing boats to catch the fish in all coastal areas. In that 2D seismic survey, there was an exclusive area for safety. Then, she explained about the studied fishing ground around the project areas, A-7, AD-5 and A-6 Marine fauna observations over time, and Marine Fauna sightings in detail. Drilling at A-6 was commenced on 27 November 2015 and concluded on 29 December 2015 and the well reached a total depth of 5,306m. The discovery intersected a gross gas column of approximately 129m. The drilling activity was successfully completed with no major health, safety or environment incidents. The seismic survey of A-6 was done from 11th April to 5th May 2016 (26 day duration) and 1,835 km^2 of seismic data was acquired. The one drill well is proposed to do in 2017 and one additional well will be carry on to drill if that one has potential for production. If the success outcome, two wells may drill in 2018 and 2019. ***U Kyaw Zaya, Deputy Director, MOGE***: explained about the drilling process of Shweyi Tun. It was done in 2015 with depth more then 5000 feet. Its target sin is 129 feet and gas was found in more than 3000 feet. The cover of well; casing which has 3 feet (36 inches) radius was drop first under the seabed and final casing has only 5 inches. The vibration of the drilling is no significant by casing and this impact is not affected to seabed and marine mammals around the well. ***Daw Myat Mon Swe, Senior Consultant, EGuard Environmental Services Co., Ltd***: carried to explain that the potential environmental and social impact assessment and its mitigation measures. Finally she explored the proposed consultation programme for A-6 Drilling.

(Question and Answer Session)

Consultation Record (Q=Question, A=Answer, C=Comment)
Q DOF: Is the training programme done near the coastal area or offshore area of the drilling area? ***A Ms. Lauranda Shaw, Senior Environmental Advisor, Woodside***: This training was done in the Sinma and Magyipin which is in the coastal area. ***C DOF***: There are no registered offshore fishing boats at DOF, Pathein. There are 40 fishing grounds in Ayeyarweddy region and offshore fishing boats from other area can catch fish in everywhere after getting the permit from Nay Pyi Taw. This is kind of a license to operate for fishing. Hyeingyi is the point for the fuel filling and marketing for all offshore fishing boats. So that the consultation in Hyeingyi is the best way to consult for offshore projects. ***Q Ms. Mia d'Adhemar, Woodside:*** Do those fishing boats have to inform the DOF regional office or the DOF state office where they fish and how much they catch? ***A DOF***: Yes, all fishing boats have to register at related DOF where area its authority included, however, they do not report their catch. ***Q Ms. Mia d'Adhemar, Woodside:*** Are the any target species in any particular area? ***A DOF***: Yes. (Please See the attached provided from DOF) ***A DOF***: We have three months of spawning season from June to August.
Thanks Remark
A Mr. Daniel Clery, Country Manager, Woodside: said that thank you for using time for our consultation.

Consultation Record of Townhall Meeting

Basic details			
Project	Block A-6 Drilling, Rakhine Basin in Myanmar		
Office/ Department/ Organization	-	**Region/ State**	Ayeyarwaddy Region
District	Pathein	**Township**	Shwe Thaungyan, Sub-Ts-Chaungthar
Village Tract **(if applicable)**	N/A	**Village** **(if applicable)**	N/A
Date and Time	14th June 2016, 10:00 AM to 12:30 PM		
Venue	Meeting room, Belle Hotel		
Remark	Meeting was held at Belle Hotel organized by Administrative Officer of GAD, Shwe Thaung Yan Township		
Purpose of the visit	Public consultation, Information disclosure of the project activities and collecting of the public comments		
Attendee	Public (46) Governmental Officer (20) NGO (1) Media (0) Total (67)		
Agenda	1) Opening Speech by Mr. Daniel Clery, Country Manager, Woodside		

	Energy (Myanmar) 2) Explanation about Drilling activities of Block-6 by U Kyaw Zayra, Deputy Director, MOGE and Daw Myat Mon Swe, Senior Consultant, E Guard Environmental Services Co., Ltd 3) Question and Answer Section 4) Closing Remark by Mr. Daniel Clery, Country Manager, Woodside Energy (Myanmar)
1) Introduction **2) Explanation**	***Mr. Daniel Clery, Country Manager of Woodside***: We are coming here to explore the pervious activities and on going plan for offshore activities of Woodside, and the consultation status of National, Regional levels done by Woodside to the public. Even the project area is really far from the coastal, we expected there would be some impact to the people living in those area, so that we want to explain about our preparation of mitigation measure for those impacts to reduce at least. MPRL E&P COMPANY's members, who are a partner, are attending this meeting as observers. Woodside did two Seismic survey and one exploration well at Block-6 in Ayeyarweddy in late 2015 and early 2016 with MPRL E&P and Total Company as well encouraged by related Ministries' staffs and the result of finding Gas was satisfied and we came back to share the updated activities of Woodside and look ahead of next activities how is the potential of Gas volume in this block. All activities of Woodside will be share to the public. Woodside is an Australia based Oil and Gas Company and we have operations 'experiences in many different countries all over the world including Myanmar. We are outstanding and all activities conducted in environmental and social standards and the environmental management plan is also understood that it should be fundamentally. The task carrying out of Woodside is starting from acquire and Exploration by Seismic survey and exploration drilling and then the development stage by production, operating stage and finally we do the supply of Gas and oil for customers by the way of construction pipeline or shifting. The task carrying out of Woodside is starting from acquire and Exploration to marketing, but only the first activities as seismic survey and exploratory drilling stage could be activated in Myanmar and the marking stage in other countries are being carried out. For Ayeyarweddy Region, the A-6 drilling was completely finish offshore and due to the result of a lot of gas finding, base ont the result, we have to do many things and after numbers of years of production, we hope to back to Myanmar for the activities on operation and marketing. The updated information will be disclosed to the public timely. Though, there are Woodside activities' in 6 Blocks in Myanmar, we are going to emphasize to explain about activities of the drilling at Block A-6. Then explained about the JV structure of Woodside Blocks in detail. Woodside is a drilling operator in A-6 and MPRL E&P which is a great local oil and gas company in Myanmar cooperated as a government liaison and Total which is a very experienced international company working since long time in Myanmar cooperated for the exploration activities of A-6. Then he introduced the members of Woodside and member of MOGE. ***Ms. Mia d'Adhemar, Woodside***: explained the social activities of Woodside done in Ayeyarweddy. As done already mentioned, Woodside understands the community in which the project would have and activities done nearby. So we do the couple of ways and we build and maintain the relationship with communities and Stakeholders. And we also understand what they value and also other activities in that area. So, where we might have those impacts by industries or other activities and we want to understand how would be interacted and how could we manage together. The third way we made that the contribution to communities as Daniel mentioned Social investment and responsibility programme, we have already started social investment programme in Ayeyarweddy Region. In the Ayeyarweddy Region, we have founded in three social programmes. The first one is Flora and Fauna International (FFI) and they are working with Pathein University to built the

	capacity in the marine science area. We have more experience in diving and we collect the more information about marine environment. We have worked through Myanmar Education Consortium, Pan Pyo Let to deliver the parenting programme in numbers of villages. So, helping parents to build and develop the children to send the school. As start the contribution in this programme, the staffs of Woodside want to donate in some emergency cases in Myanmar, so that we involved helping education packages to the primary students in the flooding area in last year by the donation of Woodside's staffs. The updated activities will also share in the future. ***U Kyaw Zaya, Deputy Director, MOGE***: explained that I am cooperating in Public Consultation with Woodside as a member of MOGE. Woodside is a famous oil and gas company in the world and it has much experience in offshore project without problem and its technology is very standard that we can recommend. The Shwe Yi Tun N0(1) well at A-6 was already drilled successfully by Woodside. Its depth was more than 5000 meter. Due to the water depth of this area of well is more than 2000 meter, the investment of the exploration is very high. At the point of the 3000 meter, they found the expected gas and announced this information of result of finding. Based on the result of exploration drill, Woodside observes to produce the commercial gas production. ***Daw Myat Mon Swe, Senior Consultant, E Guard Environmental Services Co., Ltd***: said that the previous activities of seismic survey and drilling in all Blocks by Woodside made the public consultation in three levels such as National, Regional and Township levels. This Stakeholder Meeting is the such kind of Township level meeting. At the National level, the concerned Ministries were discussed and the consultation with Chief Minister and regional Government together with related departments such as GAD, DOF, MFF and Social networks, are regional level. At the Township level consultation, the fishermen are the main stakeholders we considered to invite to attend this meeting and all related departments, NGOS in the related townships are also involved. Then, explained about the overview of A-7 and AD-5 Seismic Survey and CLO programme was done in A-7 activities. The public consultations were done from Sinma village to Hyinegyi (10 villages) along the coastal area in Ayeyarweddy region were done as CLO programme for 2D Seismic Survey in Block A-7, which is only 15 NM far from coastal area. In this consultation, the cartoon and posters could be distributed to understand all the project activities to PAPs directly and explained the period of project activities will have to be done and avoid the safety zone as 500 m around the project area and the Grievance Mechanism for the compensation of any damage on materials and livelihood restoration. After that she explained about CLO Programme how to cooperate with concerned departments to collect the public complaints and how to solve the problem. Even A-6 is really far from the coastal area, the offshore fishermen of Thabotsate village in Dawei and Myeik in Thaninyaryi Region were consulted to inform the project activities. She carried to explain the Marine Fauna sighting in actual. Then she explained that drilling at A-6 was commenced on 27 November 2015 and concluded on 29 December 2015 and the well reached a total depth of 5,306m. The discovery intersected a gross gas column of approximately 129m. The drilling activity was successfully completed with no major health, safety or environment incidents. The seismic survey of A-6 was done from 11th April to 5th May 2016 (26 day duration) and 1,835 km^2 of seismic data was acquired. The one drill well is proposed to do in 2017 and one additional well will be carry on to drill if that one has potential for production. If the success outcome, two wells may drill in 2018 and 2019. Due to the best practice of the potential environmental and social impact assessment and its mitigation measures, no interacting with communities was occurred. Most of the people worry now for the vibration of drilling activities and the explanation of drilling was given clearly that drilling make to enable the extraction of core samples of rock strata, which give us more information including gas content. Well has a diameter of 3 feet at the seabed and the hole of drilling are come down narrow up to end of drilling depth and it has cover casing to prevent the vibration.

	Then she carried to explain that the potential environmental and social impact assessment and its mitigation measure. Finally she said that the Environmental Management Plan will be conducted in EIA report and the Executive Summary of the report will be disclosed to the public in time.

(Question and Answer Session)

Consultation Record (Q=Question, A=Answer, C=Comment)
Q (Stakeholder): Asked about the impact on Mammals by chemical contained in drilling fluid and whether it cause any migration for marine mammals to other places? ***A (Ms. Laurender Shaw, Woodside):*** Explained that the location of the Block A-6 is 60 miles far from the coastal area. Due to the latest technologies and management plan using in drilling activates, the impact on the marine mammals will be reduced as least. According to the experience of working in drilling activities all over the world by Woodside, there were not found any migration problems of mammals. The top of the drilling well is really small compared with sea and the drilling unit will be also berth in that place. Most of mammals stay away from the place of drilling unit. Before the activities of drilling, the observation of marine mammals and recorded all about the sighting marine mammals in operation. The prepared EIA report includes about that information and the report will be disclosed. There are management plan for the Oil spillage to take action immediately and it must be reported to ECD.
A (Mr. Daniel Clery, Country Manager, Woodside): Told that Comments can be given by written in comment's form and the authority of E Guard will answer. These public comments will help the contribution to the good public consultation in the future. These drilling activities for A-6 will start in coming year of 2017 and the EIA report will have to be submitted to MONREC before activities. The Executive summary in Myanmar language will be disclosed. Finally thank to the attendee and hope to meet with local people again.
Thanks Remark
A Mr. Daniel Clery, Country Manager, Woodside: said that thank you for using time for our consultation.
Comments received at meeting
1) Stakeholder: We agree this project activities. ***2) Stakeholder:*** We are happy if there are no impacts on fishermen, community and marine mammals by this project. ***3) Stakeholder:*** I am very satisfy and happy on the consultation of Woodside with all representatives of fishermen, social associations and management bodies as consideration on the environment and livelihood of fishermen, and the well communication with friendship to the public and especially for our country's development. I would like to request all of you to help our people for the improvement. ***4) Stakeholder:*** Asked about the CSR programme to develop the area and prevention plan of side effect by the project activities.

Consultation Record of CM Meeting

Basic details			
Project	Block A-6 Drilling, Rakhine Basin in Myanmar		
Office/ Department/ Organization	CM Office	**Region/ State**	Ayeyarwaddy Region
District	Pathein	**Township**	Pathein
Village Tract (if applicable)	N/A	**Village (if applicable)**	N/A
Date and Time	14th June 2016, 2:00 PM to 3:00 PM		
Venue	Meeting room, CM Office		
Remark	Meeting was held at CM Office organized by Regional Secretary, District Administrative Officer, GAD, Pathein District		
Purpose of the visit	Public consultation, Information disclosure of the project activities		
Attendee	Government Officer (12)		
Agenda	1) Introduction by Mr. Daniel Clery, Country Manager, Woodside Energy (Myanmar) 2) Explanation about Drilling activities of Block-6 by U Kyaw Zayra, Deputy Director, MOGE and Daw Myat Mon Swe, Senior Consultant, E Guard Environmental Services Co., Ltd 3) Discussion Section 4) Thanks Remark by Mr. Daniel Clery, Country Manager, Woodside Energy (Myanmar)		
1) Introduction **2) Explanation**	***Mr. Daniel Clery, Country Manager of Woodside***: We did the consultation meeting here was done in last year and some of authorities attending here are already met. We are coming here to share the previous activities done in Ayeyarweddy region and updated information what we are going to do. Due to the result finding of exploration of A-6 by Woodside and MPRL E&P, we have already inform to the Government and community that the Seismic survey and drilling activities have to be done in Ayeyarweddy Region. And I am please to say this exploration activity was completely successed and very encouragingly the exploration well to find the gas commercially. Then we are very encouraging for that and we plan to continue to conduct the activities with MPRL. So that we have here to back to meet with all of you to explain the project activities and Stakeholder engagement activities. Myanmar is one of the countries to operate with Woodside for the exploration well for oil and gas production. Woodside operates the exploration, operation and production in other countries. All activities of Woodside will be submitted to the Government and public as well. Woodside is biggest Oil and Gas Company in Australia and it has very experiences on offshore in many countries all over the world. Due to the possibilities of the oil and gas production in Myanmar, Woodside has invested as a largest Austrian Company in Myanmar especially in exploration. Before the explanation of the activities of the project, the social engagement activities of Woodside should be presented first. We have intensive scholarship programme to Myanmar Students and there is some donation intended to develop in Ayeyarweddy Region. The projects in Ayeyarweddy involved in early child development to parent training programme in Pan Pyo Let, which is a local NGO through Myanmar Education Consortium around Tharbaung Township in numbers of villages itself and also funding with Flora and Fauna International to train the Marine Students and Scientists at Marine Department of Pathein University such as research on Seagrass, Coral and different kind of birds' species along the coastal area in Ayeyarweddy		

	Region. Also Swimming and diving training are involved in this training programme. As start the contribution in this programme, the staffs of Woodside want to donate in some emergency cases in Myanmar, so that we involved helping education packages to the primary students in the flooding area of Tharbaung in last year by the donation of Woodside's staffs. We are emphasizing on positive contribution to help communities where required to provide the relief fund and we would like to know any advices from Excellency. The task carrying out of Woodside is starting from acquire and Exploration to marketing, but only the first activities as seismic survey and exploratory drilling stage could be activated in Myanmar. There are Woodside activities' in 6 Blocks in Myanmar, in which Woodside is a drilling operator in A-6 and MPRL cooperated as a government liaison. We made seismic survey at blocks AD-5 and A-7 in Ayeyarweddy in last year and early this year, drilling at AD- 7 in Rakhine basin with Daewoo and another 2 Blocks AD-2 and A-4 with BG, which is an operator. I these two blocks, we did not work as an operator. As the announcement for the gas finding from Shwe Yi Tun (1) well in Block A- 6 and Thalin (1) well in Block AD-7 discovered with potential gas production by Woodside, Woodside is exciting and encouraging for the further activities. Then he explained about the JV structure of Woodside Blocks in detail. 3 Blocks are being worked with MPRL. ***U Kyaw Zaya, Deputy Director, MOGE***: explained that Woodside Energy and MOGE had signed the PSC contract in 2007. A-6 was started to explore in March 2015. Before the Woodside's activities, Block A-6 was studied by MPRL since 2007. In 2012, Pyithar well was drilled and Shwe Yi Tun (1) was drilled in March 2017. The Shwe Yi Tun Well's depth is more than 5000 m and the target result was found in more than 3000 feet. Its target sin is 129 feet. Though as announcement of finding target result, the discovery of commercial target should be done by development processes. A-6 area has about 2000 m water depth and the drilling activities will start in early 2017. ***Daw Myat Mon Swe, Senior Consultant, EGuard Environmental Services Co., Ltd***: said that the Executive Summary of IEE reports in Myanmar language of 2D and 3D Seismic surveys of AD-5 and A-7 were already done and Executive Summary in Myanmar Language were also disclosed at Chief Minister Office in early of this year. The 2D Seismic Survey of A-7 was done in the area of 1295 Square kilo meter and it was 13 days long. 3D seismic survey of AD-5 and A-7 were done to collecte the data in the area of 13, 977 km^2 and it was 126 days long. Then, explained about the overview of A-7 and AD-5 Seismic Survey and CLO programme was done in A-7 activities. Due to the existing law, rule and EIA procedure, the public consultations were done in three levels as Union, Regional and Township levels for all previous Woodside's activities. One consultation meeting was done here last time. For the current drilling activities for A-6, the consultation with relevant ministries as a national level was done and the current consultation activities with Chief Minister and regional government, related Departments, NGOs as MFF and Universities is for regional level and the holding Townhall meeting by the approve by regional level, the Stakeholder meeting will be done as township level to explore the project activities and expected impacts on social and environmental as a transparency. By the collecting of comments and advices form the people, the Environmental Management plan will be updated in the EIA report. The public consultations is shown as an example here for A-7 2D Seismic survey, which is only 15 NM far from coastal area, the consultation activities were done from Sinma village to Hyinegyi (10 villages) along the coastal area in Ayeyarweddy region. In this consultation, the cartoon and posters could be distributed to understand all the project activities to PAPs directly, which are already been in DOF of Pathein. In which Cartoon, the Marina Notice was included. Then, she explained about the structure of CLO program how to cooperate with local authorities to receive the complaints and solve the problem if it is occurred. In that time, no interacting with local fishing boats and vessels and any compensation for the

	damage were not faced. Even A-7 is located in Ayeyarweddy region, the offshore fishermen of Thabotsate village in Dawei and Myeik in Thaninyaryi Region were consulted to inform the project activities as well because about 100 fishing boats from Thanintharyi region were found before activities. Then, she explained about the studied fishing ground around the project areas, A-7, AD-5 and A-6 Marine fauna observations over time, and Marine Fauna sightings in detail. Drilling at A-6 was commenced on 27 November 2015 and concluded on 29 December 2015 and the well reached a total depth of 5,306 m. The discovery intersected a gross gas column of sin is approximately 129m. The drilling activity was successfully completed with no major health, safety or environment incidents. The seismic survey of A-6 was done from 11th April to 5th May 2016 (26 day duration) and 1,835 km^2 of seismic data was acquired. The one drill well is proposed to do in 2017 and one additional well will be carry on to drill if that one has potential for production. If the success outcome, two wells may drill in 2018 and 2019. Due to the EIA procedure issued in last year, this project has to be done EIA study and the final EIA report will be submitted in November 2016. Most of the people worry now for the vibration of drilling activities and the explanation of drilling was given clearly that drilling make to enable the extraction of core samples of rock strata, which give us more information including gas content. Well has a diameter of 3 feet at the seabed and the hole of drilling are come down narrow up to end of drilling depth and it has cover casing to prevent the vibration. Then she carried to explain that the potential environmental and social impact assessment and its mitigation measure in detail. We use Superstar Radio to communicate with fisherman to inform the current activities. Finally she said that the Environmental Management Plan will be conducted in EIA report and the Executive Summary of the report will be disclosed to the public in time.

(Question and Answer Session)

Consultation Record (Q=Question, A=Answer, C=Comment)
C. Ministry of Electric Power, Energy, Industry and Transportation: The social and environmental was in presented perfectly. As the social engagement activities done in Tharbaung, we can cooperate in this activities in the future and suggested to cooperate with Social Welfare Minister of Regional Government. ***A. Mr. Daniel Clery, Country Manager, Woodside***: Thank you very much for your offer and advice and as the early childhood development programme done in Tharbaung Township, we contacted with NGOs working with ministries. So that we plan to contact with ministries directly in our future social welfare programme. ***C. Ministry of Electric Power, Energy, Industry and Transportation***: The central Management Committee was formed for management of the any disaster. We will contact Woodside for any help. ***A. Mr. Daniel Clery, Country Manager, Woodside***: There is potential investment for the national disasters and we are doing in Arakan people to contribution for any helps. ***C. Ministry of Electric Power, Energy, Industry and Transportation***: At present in our country, all of the regionals and states' disasters are very important to help people urgently. In delta like Ayeyarweddy region, we have so many disasters. So that the Central management Committee proceed the call centers for disaster management like emergency to take action urgently. We have to manage the data collection and also contribute the money systematically. ***Q. Mr. Daniel Clery, Country Manager, Woodside***: Can I ask you a question, at the moment, we are try to contribute in power sector and where is the energy source in Pathein in Ayeyarweddy Region and what is the source of energy? ***A. Ministry of Electric Power, Energy, Industry and Transportation***: Now we have already made the

electricity development for our region because we cannot get electricity from the national grid. So that we try to use the own power generation and we arrange gas turbines and other generation for electricity supply. After development of management programme, we invited to the many companies and considered what type of own generation has to be required start to supply energy within one and half year.

C. Mr. Daniel Clery, Country Manager, Woodside: It may be possible like as Woodside and other LNG companies to ask for that and we are very happy to share this information. If there is no question on the presentation, I would like to inform you that the drilling in A-6 will be started in next year 2017, more coordinate to public.

Q ECD; The presentation by Woodside can be recommended that very clear information you presented. Although the environmental impact was shown in the presentation, I would like to ask whether the prevention action of an accident for oil spillage like as Emergency Response Plans.

A Mr. Daniel Clery, Country Manager, Woodside: Even Ms. Laurenda, our environmental advisor can explain more detail on that. We take the action speciously you mention on the environmental impact like oil spillage and every case will have to develop the emergency response plan, However, the offshore project we are working in Myanmar is to produce the dry gas.

A Ms. Laurinda, Woodside: When we made sure in assessment on environment, we identify the incredible scenarios and we assess which cause could suddenly happened. As Dan said that this is production of dry gas only, not oil, so any oil spillage will not be happened form the well. The vessels when collected the fuel can occur the risk of the oil spillage. However, on the vessels, the response plan is managed at least by Maritime requirement and there are appropriate risk assessment and we have emergency response plan as well. Due to the 16 years experience in this filed, we have no oil spill problem managed by health and safety and environment systems.

Q ECD; I would like to know about Hazardous waste management and wastewater management plan in this study will be conducted?

A Ms. Laurinda, Woodside: Yes, sure. we have and we make and identify all the different waste we produced such as the all hazardous waste and wastewater and included in assessment on that as well, and come out with the plan to be existed. We make reduce waste as much as possible at least and we try to recycle with possible ways by waste mitigation in high risky. The vessel as drill ship is like a no more ship produces the waste similar as a ship and we make sure the disposal of the waste with appropriate way of disposal and the Environmental Management Plan will be produced for our activities.

A Daw Myat Mon Swe, E Guard: Those information will be included in EMP and EMoP of EIA report.

Q. Ministry of Electric Power, Energy, Industry and Transportation: Could we have this EIA report after it is finished? Next time, I would like to discuss with the LNG companies about the sharing of GAS. I also have to buy if it is not possible to share in free of charges because the electricity supply is now every important in our region.

A Mr. Daniel Clery, Country Manager, Woodside: Yes. We might be next time we come down and discuss to provide some materials and sharing of LNG.

C. Ministry of Electric Power, Energy, Industry and Transportation: Some companies have already proposed to provide the electricity by LNG and Core Fire Plant from Singapore or somewhere, but I much prefer to have LNG.

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