Dawei LNG Terminal

DAWEI LNG TERMINAL COMPANY LIMITED

FINAL REPORT

Environmental Management Plan (EMP)

For

Dawei SEZ Initial Phase Development of LNG Terminal Project

In Dawei District, The Republic of the Union of Myanmar

Prepared by

TEAM Consulting Engineering and Management Public Company Limited

TOTAL Business Solution Co., Ltd.

April 2018

Our Ref: ENV/P03153/611008

27th April 2018

Mr. Poawpadet Vorabutr, Director:

Dawei LNG Terminal Company Limited ("DLT")

6th Floor, Salomon Business Center, 224/A U Wisara Road, Bahan Township, Yangon, the Republic of the Union of Myanmar

Subject: Submission of Final Report of ESIA for Dawei SEZ Initial Phase Development of LNG Terminal Project, Dawei District, The Republic of the Union of Myanmar

With reference to Consultation Agreement No.10P3153/2015 date 5th January 2015 and the Variation Order No. EIA-01-58, date 15th September 2015 and Official Comment of ECD for LNG Terminal Project (Number 08.02.2017).

We are pleased to submit the Final Report of ESIA for Dawei SEZ Initial Phase Development of LNG Terminal Project, Dawei District, The Republic of the Union of Myanmar (include ESIA and EMP) for your consideration.

Sincerely yours,

S. Boonyuen

Dr. Sirinimit Boonyuen

Senior Executive Vice President - International

PCT/ENV-I/P03153/FR/LE1816

FINAL REPORT

ENVIRONMENTAL MANAGEMENT PLAN FOR DAWEI SEZ INITIAL PHASE DEVELOPMENT OF LNG TERMINAL PROJECT

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INTRODUCTION

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INTRODUCTION

1.1 NEED FOR ENVIRONMENTAL MANAGEMENT PLANS

Results of an ESIA study for a proposed development project will not lead to any practical outcomes if the proposed mitigation measures and monitoring program are not implemented in the construction and operational phases of the proposed project. Therefore, an ESIA study will need to extend beyond impact assessment to planning for implementation of the proposed mitigation measures and monitoring program. In this regard, the results of the ESIA study will need to cover preparation of two Environmental Management Plans (EMPs): (i) one EMP for implementation by the contractor in the construction phase; and (ii) one EMP for implementation by the project proponent in the operational phase. Recognizing this fact, the ESIA Procedure requires the ESIA study to include preparation of a Construction Phase EMP (CEMP) and an Operational Phase EMP (OEMP).

The two EMPs are defined in the ESIA Procedure (2015) as follows:

Construction Phase EMP *means a detailed and comprehensive Environmental Management Plan (EMP) for the pre-construction and construction phase of a Project. Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements and include a description of the construction works, present an overview of Adverse Impacts, present mitigation measures and monitoring programs together with time schedules, overview maps, images, aerial photos, satellite images, site layout plans, cross-sections, transects, environmental management and monitoring sub-plans for each construction site, thematic sub-plans, and management procedures as appropriate.*

Operational Phase EMP *means a detailed and comprehensive EMP for the operational phase of a Project. Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements. The plan shall include a description of the Project operations, installations, and infrastructure, and shall present an overview of Adverse Impacts, present mitigation measures together with time schedules, overview maps, images, aerial photos, satellite images, site layout plans, cross-sections, transects, environmental management and monitoring sub-plans for each Project site, thematic sub-plans, and management procedures as appropriate.*

In case of decommissioning phase, the EMPs are similar to those recommended for the construction phase. The EMP during commissioning phase depends on decision of the Concerned Authorities confirm to remove of all components at the end of concession.

The above two definitions clearly indicate that the two EMPs required by Ministry of Natural Resources and Environmental Conservation (MONREC) will be comprehensive and have more details than conventional EMPs presented in ESIA reports of the past. This requirement of MONREC is in line with current good ESIA practices.

1.3 ORGANIZATION OF THIS EMP DOCUMENT

This EMP document is structured to follow the two outlines as appropriate within the environmental management context of this Project. The essence of each chapter following this introductory chapter is as follows:

Chapter 2 - Project Proponent's environmental and social policy and commitments

Chapter 3 - Institutional Arrangements

Chapter 4 - Legal Requirements

Chapter 5 - Summary of Impacts and Mitigation Measures

Chapter 6 - Construction Phase EMP

Chapter 7 - Operation Phase EMP

Chapter 8 - Emergency Plan

Chapter 9 - Implementation Budget and Schedule

1.4 NEED FOR UPDATING THE EMPs

The CEMP and OEMP presented in this Document are based on preliminary project designs and initial construction plans and schedules. Therefore, the two EMPs should be considered as framework plans. They are intended to provide framework and prescribe requirements for the preparation of detailed CEMP and OEMP by the Engineering Procurement Construction (EPC Contractor). In this regard, the Project Proponent will require the EPC Contractor to prepare a detailed CEMP in due course before commencing the construction, and a detailed OEMP in due course before commercial operation of the project.

The Contractor will use the CEMP presented in this Document as the basis to prepare a detailed CEMP based on the Contractor's final designs, construction plan and methods, and construction schedule. The scope and content of the Contractor's CEMP will not be less than the scope and content of the CEMP in this Document. The Contractor's CEMP shall be contractually binding. During the construction, the Contractor will implement the Contractor CEMP under the supervision of the Project Manager to be appointed by the Project Proponent (Owner).

As the Contractor will be responsible for the design, supply, installation, testing, and commissioning of the LNG Terminal and its associated facilities, the Contractor will use the OEMP presented in this Document as the basis for preparing a detailed OEMP based on the actual construction, results of plant commissioning, and final operational procedures. The LNG Terminal Management Team of the Project Proponent or Owner will review and revise the Contractor's OEMP as appropriate to prepare the Owner's OEMP for implementation in the operational phase.

For clarity, the application of the ESIA's EMPs as above described is shown as a diagram in ***Figure 1.4-1***.

1.2 GENERIC SCOPE OF AN EMP

Environmental management is based on the basic principle of management known as the Deming cycle: Plan (P), Do (D), Check (C) and Act (A) (see ***Figure 1.2-1***). Environmental management thus consists of four related tasks:

(i) Plan (P) - what need to be done;

(ii) Do (D) - implement the plan;

(iii) Check (C) - monitor and evaluate the results of implementation

(iv) Act (A) - taking corrective actions to improve the results, if found inadequate

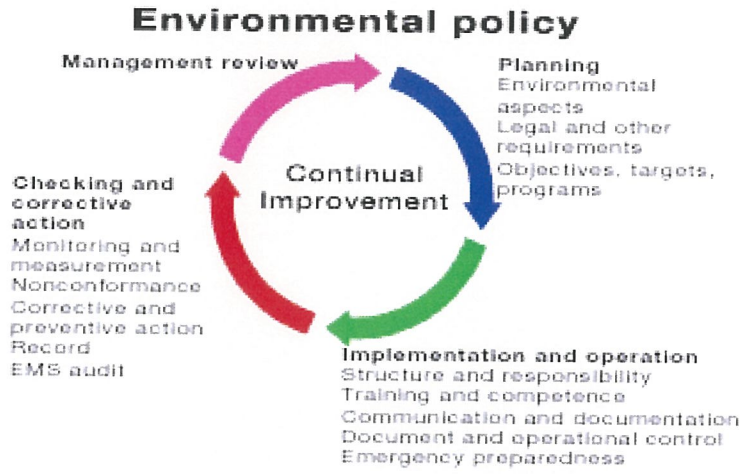

FIGURE 1.2-1 : PDCA CYCLE FOR ENVIRONMENTAL MANAGEMENT

Therefore, an EMP will need to cover the following subjects: (i) mitigation measures to be implemented; (ii) arrangements for the implementation of mitigation measures; (iii) monitoring, evaluating and reporting of the implementation of mitigation measures to provide feedback information on whether the environmental performance deviates from the prescribed benchmarks; (iv) corrective actions process if the environmental performance below the benchmarks, environmental incident response, and emergency plan; (v) arrangements for operating the Social Management System (EMS), including organizational structure, responsibilities, documentation, training, communication, and management review; and (vi) involvement of stakeholders or affected people in environmental management, including public grievance redress mechanism.

It should be noted that the context of the six elements of environmental management during project construction will be different from those during project operation. Therefore, it is preferable to present a CEMP separate from an OEMP to facilitate their use and reference.

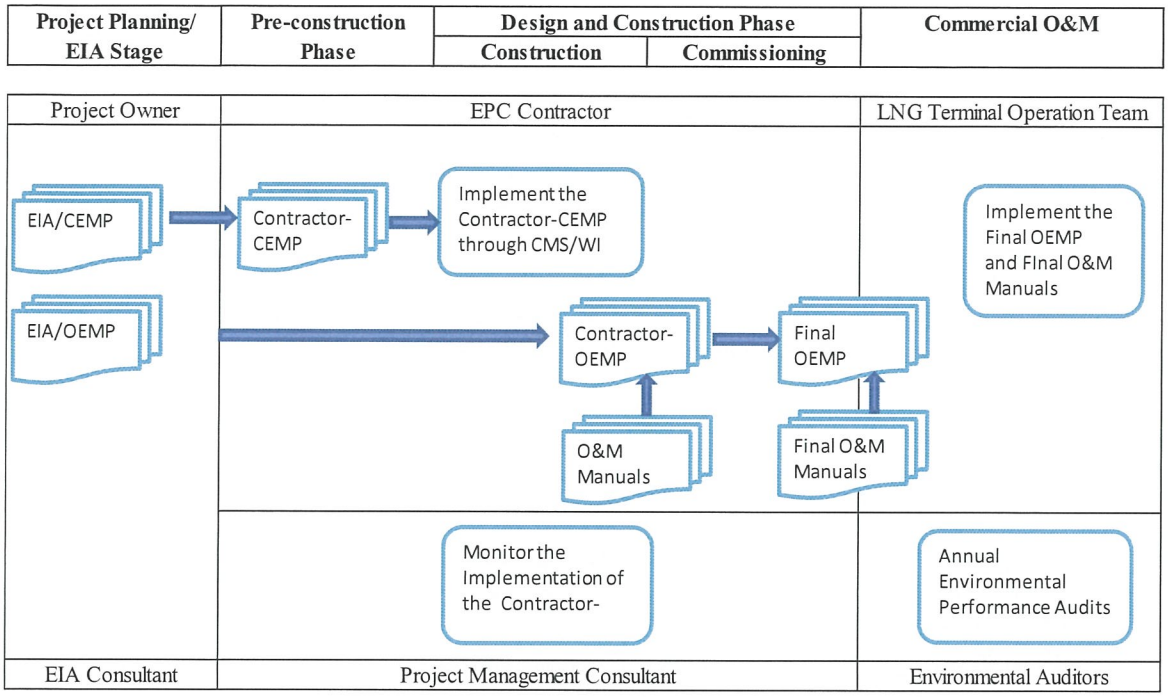

FIGURE 1.4-1 : APPLICATION OF THE EIA'S EMPS

CHAPTER 2

PROJECT PROPONENT'S ENVIRONMENTAL AND SOCIAL POLICY AND COMMITMENTS

CHAPTER 2

PROJECT PROPONENT'S ENVIRONMENTAL AND SOCIAL POLICY AND COMMITMENTS

2.1 CORPORATE ENVIRONMENTAL AND SOCIAL POLICIES

Being a newly established company, DLT, the Project Proponent, has not yet formulated its environmental and social policies. However, DLT's Management is committed to the sustainable development principle in implementing this Project. Therefore, the Project Proponent intends to formally state its environmental and social policies in due course to guide its environmental and social management during the construction phase and the operation phase of the Project. The policies will be in line with the policies adopted by the Myandawei Industrial Estate Company Limited in environmental and social management of its development activities in DSEZ. The policies can be briefly described as follows:

Environmental Policy

- Will comply with relevant environmental laws and regulations;
- Will manage our business with the goal to alleviate the adverse effects on the environment, undertake appropriate reviews and evaluations of our performance to measure and to ensure compliance with this environmental policy;
- Will encourage employees to have strong concern and be responsible for the clean environment; and
- Will educate the employees on the environment including exchanging the knowledge with other agencies in order to continuously and regularly maintain good environment and adopt working practices friendly to the environment.

Safety and Health Policy

- Will strive to prevent accident, injury and occupational illnesses through active participation of every employee.
- Commit to making consistent efforts to identify and eliminate or manage safety risks associated with our activities.
- Will strictly comply with all applicable laws and regulations. In case that no enforceable body of law exists, we will apply reliable standards of our own.
- Will arrange for the proper design of tool and equipment, regulations, training and the control tools in a manner that safeguards workers, property and the communities in which we operate from machine, working procedures and occupational illnesses.
- Employees who report to work with illegal drugs in their system or report with level of alcohol or other chemical substances that could impair performance are subject to strong disciplinary action.

In line with this policy, the Project will commit to the followings:

During Construction: The Project will endeavour to minimize environmental impacts and meet all EHS requirements during the construction. This will be achieved through adopting designs, construction methods, construction management practices, and impact mitigation measures. The Project EHS performance will be measured and evaluated against applicable national or international standards and guidelines prescribed by MONREC or proposed in the CEMP. In addition, the Project will establish an environmental management system (EMS) for the Project construction.

During Operation: The Project will endeavor to minimize environmental impacts and meet all EHS requirements of the LNG Terminal operation and maintenance (O&M). This will be achieved through adopting: (i) best available technologies in the LNG Terminal design and operation; and (ii) effective impact mitigation measures proposed in the EIA. The Project EHS performance will be measured and evaluated against applicable national or international standards and guidelines prescribed by MONREC or proposed in the OEMP. The Project will also establish an EMS specific for the LNG Terminal operation, which will follow principles and good practices in environmental management of LNG Terminal.

2.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

The Project Proponent will establish an environmental and social management system (ESMS) to support the implementation of the CEMP and the OEMP. The ESMS for the construction phase is described in the CEMP while that for the operational phase is described in the OEMP.

In addition, the Project Proponent will require the EPC Contractor to establish its own ESMS to support its implementation of the detailed CEMP.

2.3 ENVIRONMENTAL AND SOCIAL PROCEDURES AND GUIDELINES

Health, Safety, Environmental Management General Guidelines, and Health, Safety and Environmental Risk Assessment for Site Activities will be established in accordance with the policy stated in ***Section 2.1***.

2.4 ENVIRONMENTAL AND SOCIAL COMMITMENTS

DLT's environmental and social commitments are clearly indicated in its policy statement in ***Section 2.1***. In this Project, DLT will make at most efforts to minimize environmental and social impacts that the Project may cause in its construction and operation, DLT recognizes the need for the Project to exist in harmony with all stakeholders, particularly the communities surrounding the Project site.

CHAPTER 3

INSTITUTIONAL ARRANGEMENTS

CHAPTER 3

INSTITUTIONAL ARRANGEMENTS

3.1 RESPONSIBILITIES OF THE PROJECT PROPONENT

The Project Proponent is legally responsible for environmental performance of the Project as prescribed in the Environmental Compliance Certificate (ECC) and other permits. The Project proponent will report to Ministry of Natural Resources and Environment Conservation (MONREC) on the Project's environmental and social performance, also to other authorities responsible for specific environmental and social issues relevant to the Project.

Specifically, the Project Proponent will have the following responsibilities:

Pre-Construction and Construction Phases

1) Ensure that the Contractor will update the CEMP presented in this document to prepare a detailed CEMP based on the results of detailed design, construction plan, and construction schedule.

2) Establish and operate an environmental and social management system (ESMS) containing elements outlined in this EMP.

3) Supervise the Contractor closely in implementing the Contractor CEMP as an integral part of its project implementation management and construction supervision.

4) Submit periodic monitoring and audit reports to MONREC as required in the EIA Procedure and concerned authorities such as Port Authorities.

5) Notwithstanding the periodic monitoring reports to be submitted to MONREC, keep MONREC and other concerned authorities informed of any serious environmental events and responses to the events.

6) Conducting periodic audit of environmental and social performances of the Contractor.

Operational Phase

1) Ensure that the Contractor will update the OEMP presented in this document to prepare a detailed OEMP based on the results of detailed design, results of commissioning, and operational manuals.

2) Establish and operate an environmental and social management system (ESMS) containing elements outlined in this EMP. The ESMS will be part of the management system of the LNG Terminal.

3) Establish an environmental, health and safety (EHS) unit within the organization for operation and maintenance of the LNG Terminal Facility (both onshore and offshore areas). The EHS unit will be adequately staffed with qualified personnel.

4) Ensure that the LNG Terminal Manager will operate the ESH unit to comply with all ESH requirements prescribed in the ECC.

5) Submit periodic monitoring and audit reports to MONREC as required in the ESIA Procedure and concern authorities such as Port Authorities.

6) Notwithstanding the periodic monitoring reports to be submitted to MONREC, keep MONREC and other concerned authorities informed of any serious environmental events and responses to the events.

7) Conducting annual audit of environmental and social performances of the LNG Terminal.

3.2 RESPONSIBILITY OF THE CONTRACTOR

The Contractor, including its approved sub-contractors, is contractually responsible to the Project Proponent for environmental performance of the project construction as prescribed in the Contract.

Specifically, the Contractor will have the following responsibilities:

1) Prepare a detailed Contractor CEMP for review and approval by the Project Proponent. The Contractor CEMP should follow the outline prescribed by the Project Proponent as proposed in ***Appendix 6A***.

2) Implement the mitigation measures during the construction through construction method statements and work instructions in strict conformance with environmental conducts prescribed in the Contract.

3) Ensure that all process and environmental control equipment meet all technical specifications related to their environmental performance.

4) Conduct periodic monitoring and reporting of its compliance with the environmental and social performance prescribed in the Contract.

5) Ensure that its sub-contractors shall comply with the Contractor CEMP.

6) Consistently update the Contractor CEMP and submit the updated version to the Project Proponent for approval.

3.3 RESPONSIBILITY OF MONREC AND PORT AUTHORITIES

MONREC is the key agency to monitor and evaluate environmental performance of the construction and operation.

Other agencies concerned such as Port Authorities will cooperate with MONREC in the monitoring and evaluation of project implementation and environmental performance of the project during pre-construction, construction, and operation.

3.4 RESPONSIBILITY OF STATE/REGION AND DISTRICT AUTHORITIES

Local government authorities are the regulator to monitor and evaluate environmental performance of the pre-construction, construction, and operation.

3.5 RESPONSIBILITY OF THE ENVIRONMENTAL, HEALTH AND SAFETY (EHS) UNITS

In the construction phase, the Project Proponent will establish an ESH unit within its project management organization. In the operational phase, the Project Proponent will establish an ESH unit within the organization for Operation and Maintenance of the power plant and its associated facilities. Functions and responsibilities of the two EMS units are described in the CEMP and OEMP.

Arrangements for Operating the EMS

There are three key groups with responsibility for environmental management of the Project:

- Project Proponent or Project Owner who manages the Project through a Project Manager;
- Contractor as the party undertaking the pre-construction and construction; and
- MONREC through Environmental Conservation Department (ECD), Port Authorities, and other government agencies at the regional, township and community levels.

CHAPTER 4

LEGAL REQUIREMENTS

CHAPTER 4

LEGAL REQUIREMENTS

4.1 SUMMARY OF KEY LEGAL REQUIREMENTS

Environmental management of the Project will comply with legal requirements pertinent to the EMP prescribed in the Environmental Conservation Rule 2014, and the Final EIA Procedure 2015.

A. Environmental Conservation Rules 2014

Chapter IX, Articles 41 to 46 prescribes the tasks regarding waste management under the control of MONREC and the Environmental Conservation Department. Waste management covers hazardous wastes, solid wastes, wastewater and emissions.

B. EIA Procedure 2015

Articles in the EIA Procedure relevant to the preparation and implementation of the EMPs are summarized in ***Table 4.1-1***. Preparation and implementation of the two EMPs will need to comply with relevant articles in the table.

TABLE 4.1-1
CONTENT OF THE EIA PROCEDURE RELEVANT TO THE EMPS

Subject	Relevant Articles
Content of the EMPs	63
Project Approval Requirements	
- Issuance of an ECC	70
- Conditions of the ECC	87,88,89,90,91,92,93,94,95,96,97,98,99,100,101
- Submission of an CEMP and OEMP	91,92,94,100
Revision and updating the EMPs	94,95,96,97,98,99,101
Implementing the EMPs	102,103,104,105
Monitoring and Reporting	
- Responsibility for Monitoring	106,107
- Content of Monitoring Report	109
- Submission of Monitoring Report	108
- Disclosure of Monitoring Report	110
- Inspection by MONREC	111,112,113,114,115,116,117,118,119,120,121,122

4.2 PROJECT STANDARDS

Environmental management of the Project during construction and operation will comply with the national or international environmental and social guidelines and standards as appropriate. The international guidelines and standards will be adopted only when the national guidelines and standards do not exist. In addition, the Project will control emissions following the standards which are specifically agreed in the drafted concession agreement of the Project.

Table 4.2-1 presents international ambient environmental quality standards to be adopted as the national ambient environmental quality standards have not yet been issued. ***Table 4.2-2 to Table 4.2-3*** presents national environmental quality standard (ambient air and noise). ***Table 4.2-4*** presents national effluent standards to be adopted for onshore LNG facilities. ***Table 4.2-5*** presents national effluent standards to be adopted for port, harbor, and terminal facilities. The national effluent standards for both the onshore LNG facilities and the port, harbor, and terminal facilities will be the performance targets for environmental management plan of the Project.

TABLE 4.2-1

RELEVANT INTERNATIONAL AMBIENT ENVIRONMENTAL GUIDELINES AND STANDARDS

Subjects	Parameters	Values	References
Ambient Air Quality (24 hour average)	TSP average 24-hour PM10 average 24-hour NO_x as NO_2 average 1-hour NO_x as NO_2 average 24-hour SO_2 average 24-hour CO average 1-hour	230 µg/m^3 150 µg/m^3 200 µg/m^3 150 µg/m^3 125 µg/m^3 43,200 µg/m^3	- Thermal Power: Guidelines for New Plant, Pollution Prevention and Abatement Handbook WORLD BANK GROUP, 1998 - WHO Ambient Air Quality Guidelines stated on Environmental, Health, and Safety Guidelines: Environment Air Emissions and Ambient Air Quality of International Finance Corporation, 2007 - The National Ambient Air Quality Standards for Carbon Monoxide, U.S. EPA. 2011
Ambient Noise Levels **- industrial and commercial area** **- residential areas**	Leq (24-hrs) Leq (1-hr) Lmax	70 dB(A) 55 dB(A)daytime 45 dB(A) nighttime 115 dB(A)	Environmental, Health, and Safety (EHS) Guidelines: General EHS Guide GUIDELINES:ENVIRONMENTAL NOISE MANAGEMENT, World Bank/IFC, 2007
Vibration **- for industrial buildings and residential building**	Peak Particle Velocity (PPV) Human Response (PPV)	5 mm/s 0.035 in/sec (Bare Perceptible)	DIN4150 Wiss, 1974

TABLE 4.2-1

RELEVANT INTERNATIONAL AMBIENT ENVIRONMENTAL GUIDELINES AND STANDARDS (CONT'D)

Subjects	Parameters	Values	References
Coastal Water Quality	DO	not less than 4 mg/L	Marine water quality criteria for the ASEAN Region for aquatic life protection, 2008
	pH	5.0-9.0	
	Nitrate Nitrogen	≤ 60 µg/L	
	Phosphates as P	≤ 15 µg/L for coastal ≤ 45 µg/L for estuarine water	
	Lead	≤ 8.5 µg/L	
	Cadmium	≤ 10 µg/L	
	Mercury	≤ 0.16 µg/L	
	Temperature (incremental increase)	< 2° C above the maximum	ASEAN proposed Marine Water Quality Criteria (Only Malaysia)
	SS	Ambient water temperature < 50 mg/L	
Sediment Quality		Maximum limits	International Association for Impact Assessment (IAIA) NOAA Screen Quick Reference Table, 2004
	Total Chromium	81 mg/kg	
	Total Arsenic	8.2 mg/kg	
	Total Lead	46.7 mg/kg	
	Total Nickel	20.9 mg/kg	
	Total Zinc	150 mg/kg	
	Total Copper	34 mg/kg	
	Total Mercury	0.15 mg/kg	
Groundwater Quality	pH at 25° C	6.5-8.5	WHO's Guidelines for Drinking Water Quality, 2011
	Nitrate-Nitrogen	≤ 11 mg/L	
	Nitrite-Nitrogen	≤ 0.9 mg/L	
	Cadmium	≤ 0.003 mg/L	
	Lead	≤ 0.01 mg/L	
	Arsenic	≤ 0.01 mg/L	
	Copper	≤ 2 mg/L	
	Mercury	≤ 0.006 mg/L	
Thermal Heat Flux	Safe level of exposure at the property line of LNG storage facility	5 kW/m^2 (1,600 Btu/hr ft^2)	NFPA 59A (standards for the production facility)

TABLE 4.2-2
NATIONAL AMBIENT AIR QUALITY STANDARD

Parameter	Average Period	Guideline Value (µg/m^3)
Nitrogen Dioxide	1-year	40
	1-hour	200
PM-10	1-year	20
	24-hour	50
Sulfur Dioxide	24-hour	20
	10 minute	500

Source: National Environmental Quality (emission) Guidelines 2015, Myanmar

TABLE 4.2-3
NATIONAL NOISE LEVEL STANDARD

Receptor	One Hour LAeq (dBA)	
	Day Time (07:00-22:00)	Nighttime (22:00-7:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: National Environmental Quality (emission) Guidelines 2015, Myanmar

TABLE 4.2-4

NATIONAL EFFLUENT STANDARDS TO BE ADOPTED FOR ONSHORE LNG FACILITIES

Parameter	Guideline
Hydrotest Water[1,2]	For discharge to surface water or land – Total hydrocarbon content 10 mg/l – pH 6-9 – 5-day Biochemical oxygen demand 25 mg/l – Chemical oxygen demand 125 mg/l – Total suspended solids 35 mg/l – Phenols 0.5 mg/l – Sulfides 1 mg/l – Heavy metals (total) 5 mg/l – Chlorides 600 mg/l (average), 1,200 mg/l maximum
Hazardous storm water drainage[1,2]	Storm water runoff should be treated through an oil / water separation system able to achieve oil and grease concentration of 10 mg/l
Cooling water [1,2]	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 meters from point of discharge. Free chlorine (total residual oxidant in estuarine / marine water) concentration in cooling / cold water discharges (to be sampled at point of discharge) should be maintained at 0.2 parts per million
Sewage[1,3]	Holding and discharge to municipal or centralized wastewater treatment systems or onboard treatment to achieve: – 5-day Biochemical oxygen demand 30 mg/l – Chemical oxygen demand 125 mg/l – Oil and grease 10 mg/l – pH 6-9 – Total coliform bacteria 400/100 ml – Total nitrogen 10 mg/l – Total phosphorus 2 mg/l – Total suspended solids 50 mg/l

Sources : 1) National Environmental Quality (emission) Guidelines, 2015.
2) Effluent Level for LNG Facilities, Environmental, Health, and Safety Guidelines for Liquefied Natural Gas (LNG) Facilities, World Bank/ IFC, April 2007.
3) Indicative Values for Treated Sanitary Sewage Discharges, Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Environmental Wastewater and Ambient Water Quality, World Bank/ IFC, April 2007.

TABLE 4.2-5

NATIONAL EFFLUENT STANDARDS FOR PORT, HARBOUR, AND TERMINAL FACILITIES

Parameter	Unit	Maximum Concentration
Biological oxygen demand	mg/l	30
Chemical oxygen demand	mg/l	125
Oil and grease	mg/l	10
pH	-	6-9
Total coliform bacteria	100 ml	400
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50

Sources : 1) National Environmental Quality (emission) Guidelines, 2015.
2) Indicative Values for Treated Sanitary Sewage Discharges, Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Environmental Wastewater and Ambient Water Quality, World Bank/ IFC, April 2007.

CHAPTER 5

SUMMARY OF IMPACTS AND MITIGATION MEASURES

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5.1 PROJECT DESCRIPTION

A. Project Background

The Project is part of the infrastructure development under the Initial Phase Development of DSEZ.

As DSEZ will not be able to connect to the national power grid, it has to generate its own electricity to supply its clients. Consequently, this LNG Terminal Project was conceived to supply natural gas to a proposed 420 MW power plant project. The Project will ensure adequate and reliable supply of natural gas to the proposed power plant.

B. Project Location and Overview of the Project Site

The Project can be divided into two major components: (i) onshore component (***Figure 5.1-1)***; and (ii) offshore component (***Figure 5.1-2***). The site has a trapezoidal shape and is about 1,730 m long along the shoreline.

The onshore facilities will be constructed on a 124 acre land plot (about 50.2 ha[1]) in DSEZ.

The base of the trapezoidal is about 1,897 m long and its south side is about 323 m and the north side 276 m long. Adjacent to the northern boundary of the Project site are the sites of the proposed boil-off power plant and the proposed 420 MW power plant. The nearest community is the fishing village of Nga Pitat, about 0.79 km from the southern boundary of the Project site. This village is outside the boundary of DSEZ. Other two villages, Nyaung Bin Siek and Mudu, are further away, about 2.97 km and about 2.81 km from the Project site, respectively.

Currently, the Project site is not inhabited. It covers the last section of a creek named *Britney Creek.* This creek is about 4.4 km long of which about 1.4 km of its inland section is in the Project site. The remaining 3 km of the creek, with a connection to the sea, is outside the Project site.

Existing geographical conditions of the Project site can be divided into four types:

- Swampy area covering the creek
- Scattered patches of degraded mangrove areas
- Patches of degraded beach forest
- Strand of fertile mangrove existing in the second part of the Project site

[1] 1 hectare is about 2.47 acres

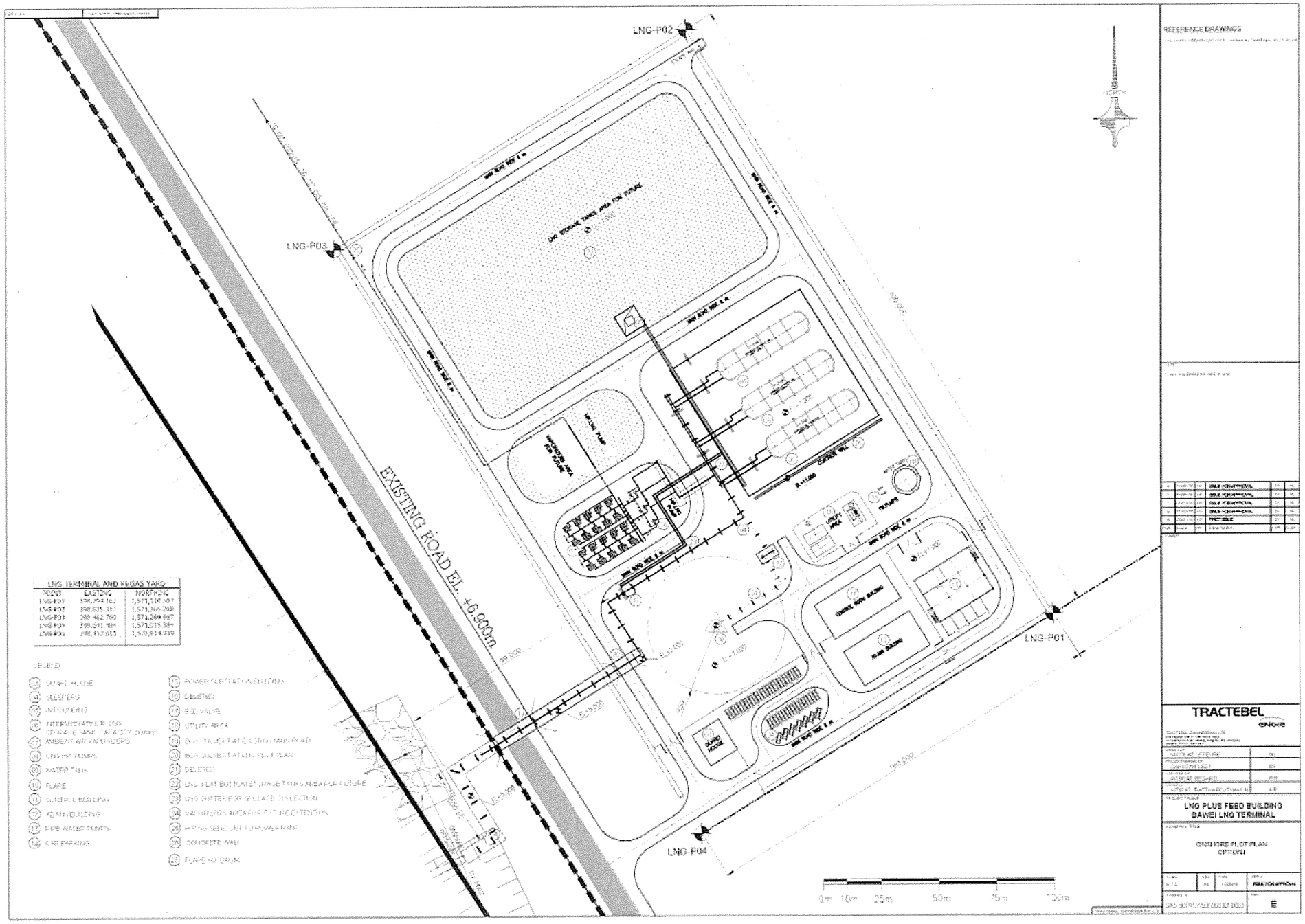


FIGURE 5.1-1 : LAYOUT OF ONSHORE FACILITIES

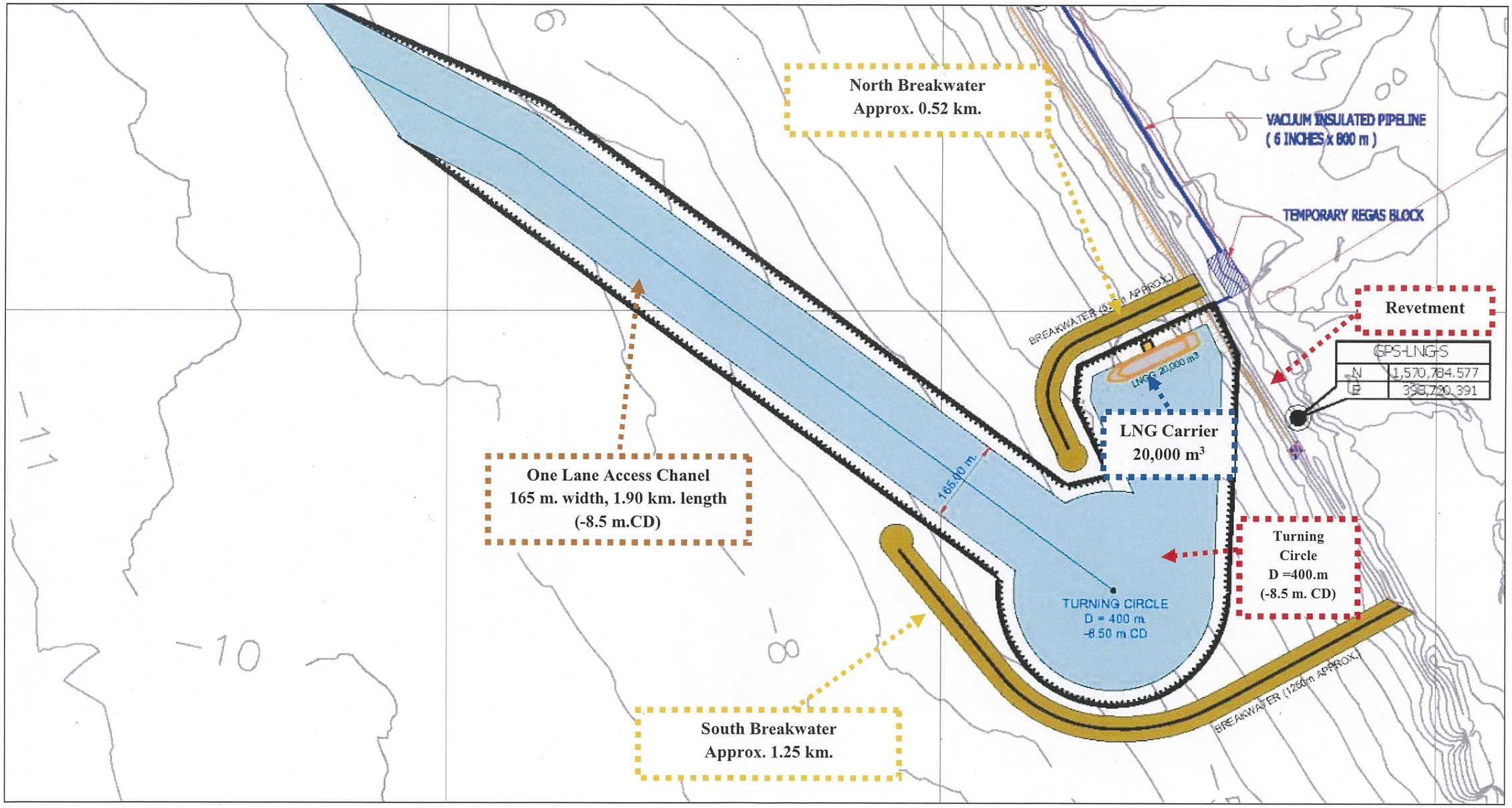


FIGURE 5.1-2 : LAYOUT OF OFFSHORE FACILITIES

The offshore facilities will cover about 370 acres (about 149.8 ha) of coastal water area accommodating two breakwaters, an approach channel, and one jetty for LNG tankers with an access bridge and trestle.

C. Project Development and Implementation Schedules

As of the end of June 2016, the Project has been developed to the detailed design stage. The Project is to be implemented on an engineering, procurement, and construction (EPC) contract. The Project Proponent intends to commence the construction in the first quarter of 2016. The construction would take about 15 months to complete. The Project would be ready for commercial operation in the second quarter of 2018

D. Facilities and Infrastructure

The major facilities can be divide into 2 unit including

Facilities	Key Information	Purposes or Functions
Offshore Facilities		
LNG Carrier	Storage Capacity = 20,000 m^3 with 300 m^3/h transfer rate, Pressure = 0.245 bar Carrier size = 20,000 to 45,000 m^3 with 263 m^3/h transfer rate, 1unit of boil-off heater and boiler	To store LNG while sending out the LNG to the storage tanks for regasification
One Lane Access Channel - Dimensions - Turning circle	 Length-1.90 km, width-165 m, and depth-8.50 m Diameter-400 m, depth 8.50 m	Entrance with adequate water depth for LNG carrier
Jetty	Composed of - A platforms for unloading of LNG from LNG carrier - Berthing and mooring dolphins with interconnecting catwalks - Pipe trestle with piperack and fire water platform - Access bridge for vehicles (via the northern breakwater)	To unload LNG carriers
Breakwaters	North Breakwater = 0.52 km long South Breakwater = 1.25km long	To minimize waves in the mooring area
Revetment	Rock revetment between breakwater	Prevent shoreline erosion caused by wave generated by LNG carrier and tugboat
Vacuum Insulates Pipe	6 inches in diameter, 480 m in length approx. 1.5 km Maximum Pressure Condition = 2 bar	To send the LNG from LNG Carrier to the buffer tank

Facilities	Key Information	Purposes or Functions
Onshore Facilities		
LNG storage tank	Three tanks, each tank: -volume = 3,000 m^3 -weight = 3,969 tons -pressure = 2 bar -min. operating temp = -197 °C -max operating temp = 38 °C 0.04% max of boil-off gas rate/day	To store and feed LNG to the regasification plant
Ambient Air Vaporizers	- 20 units connect to three buffer tanks	To convert LNG from liquid to gas form.
Send out System (Gas Pipeline)	- natural gas pipe line, carbon steel, 16 inches in diameter and 6 km long extending from the terminal to the 420 MW power plant, - Pressure = 40 – 50 bar - Transfer rate = 620 L/min - minimum temp after vaporizer = 15°C	Deliver fuel gas to 420 MW (but starting from 60 MW) Small Power Plant
Boil-off Gas Pipeline	Stainless steel, diameter = 10 inch. Pressure = 0.2 bar Transfer Rate = 0.6 m^3/h	To send boil-off gas to the 15 MW boil-off gas power plant
Send out System (Gas Pipeline)	- natural gas pipe line, carbon steel, 16 inches in diameter and6 km long extending from the terminal to the 420 MW power plant - minimum temp after vaporizer = 15°C	Deliver fuel gas to 420 MW (but starting from 60 MW) Small Power Plant
Boil-off Gas Pipeline	Stainless steel, diameter = 10 inch.	To send boil-off gas to the 15 MW boil-off gas power plant
Detector	Low temperature sensor Infrared Detector Ultraviolet /infrared detector Double Isolated Chamber	- To alert in case of LNG spill - To alert in case of flammable gas leakage - To alert in case of flammable - To alert in case of smoke
Control Valves	In the ambient air vaporizers In the boil-off gas pipeline	- To control flow of LNG both liquid and gas

E. Project Activities

Pre-Construction Phase

Activities in the pre-construction phase will include; (i) Land Clearance and, (ii) Land Filling and Compaction. The site preparation works will be completed in about 4 months.

Construction Phase

(1) Onshore Structure

The construction of onshore area will consist of (i) civil works, (ii) mechanical works and (iii) electrical works.

(2) Construction Materials for Onshore Structure

Basic construction materials such as sand and aggregate will be sourced from quarries near DSEZ and from the dredged materials, if suitable. Cement, steel and other materials will be procured from sources in Thailand or Myanmar, whichever will be more cost-effective.

Gas storage tanks will be imported in prefabricated parts for fabrication on site. Most imported process instrument, equipment and machineries would come in complete form ready for erection or installation on site. Pipes, fittings, valves, and appurtenances, and cables will be imported. All imported materials will be shipped to the small port for transfer by trucks to the Project site.

The project plan to use pneumatic system (Nitrogen) instead of hydrostatic testing water. Therefore, there is no need to treat the hydrostatic testing water.

(3) Offshore Construction

(a) Dredging

The offshore construction will involve dredging of the sea bed to create the approach channel, ship turning area, ship berths, and dry bulk berth pocket and waterfront. Total dredged volume from dredging activities are 1,852,000 m^3. All of the dredged materials will be used for filling the onshore site. The remaining materials will be used for filling of sites for other projects such as the small power plant, the boil-off power plant, and the coastal road projects.

(b) Breakwater Construction

Two rock breakwaters will be constructed-the north breakwater about 0.52 km long and the south breakwater about 1.25 km long. The two breakwaters have been designed as rubble mound breakwaters. It consists of a mound of coarse stone, also known as a core, covered or protected by blankets or layers of heavier stones. The construction requires the use of both land-based and floating heavy equipment. Typical land-based equipment used are crawler cranes, hydraulic excavators, bulldozers, and tipper trucks. Floating equipment commonly used is floating crane and hopper barges. Tugboats are used for moving the floating equipment.

(c) Revetment Construction

The tug area is proposed to be at the north corner of the port basin. For construction activity, the area (the tug berth area) will be dredged (-7mCD), 250 m along the shoreline will be the area for revetment.

(d) Jetty and Unloading Facilities

To unload LNG carriers, jetties, dolphins and mooring piers are needed. The jetty's substructure will consist of a concrete platform on tubular steel piles, on which the pipelines and unloading arms will later be fitted. An access bridge and catwalks to the mooring piers will complete the substructure. The jetties are expected to be the only facilities to require foundation piles. In this Project, a jetty will be built on land adjacent to the berth of the LNG.

(4) Construction Materials for Offshore Structure

Rock for the construction of breakwaters will be sourced from local quarries. The two breakwaters would require approximate 881,500 m^3 of rock of various sizes. The EPC Contractor will prepare a detailed plan for sources of rock supply and methods of transporting the rock from the quarry site to the construction site.

LNG unloading equipment and pipes will be imported in complete form ready for erection or installation on site. Pipes, fittings, valves, and appurtenances, and cables will be imported. All imported materials will be shipped to the small port for transfer by trucks to the Project site.

Operation Phase

The LNG terminal and facilities will be routinely operated and maintained throughout the working life of the facilities. All safety measures will be routinely checked to ensure their readiness for operations. The major facilities include: LNG pipeline, High Integrity Protection Systems (HIPS), LNG Storage Tanks, High Pressure LNG Pumps, Ambient Air Vaporizers, Gas Metering Station, Gas Pipeline, Main Control Room and Laboratory, Utility Systems, etc. Operation and maintenance (O&M) of the LNG Terminal are routine activities.

Operation Process: ***Figure 4.4-6*** in Chapter 4 is a simplified process diagram of the LNG terminal's operations. The process involves the following unit operations: reception of the LNG tankers, unloading of the LNG cargos, tanking, regasification, metering, odorization, and sending out the natural gas into the gas supply line. LNG Onshore Regasification Facilities will be developed in multiple phases with sufficient capacities to meet increasing demands.

Vessel: Main of vessel will be used during operation phase are LNG Carries. The sizes of LNG carriers will be between 20,000 to 45,000 m^3. The LNG carrier will offload the imported LNG to the storage tanks at a rate of about 263 m^3/h. Depending on demand, a single LNG carrier will travel approximate 36 supply runs per year between Dawei and source of LNG e.g. Singapore (approximately 10 days per round-trip run).

Storage of the LNG: The LNG is then stored in cryogenic tanks (designed for very low temperatures). The storage tanks are able to withstand a temperature of -197°C in order to keep the LNG in its liquid state to limit boil-off. The low-volume boil-off that nevertheless occurs is collected and sent out to the boil-off gas power plant, or reincorporated into the LNG tanks.

Regasification: The LNG is pumped out from the cryogenic tanks and routed via, LNG Booster PUMP, and Ambient Air Vaporizers from where vaporized natural gas is exported via pipeline. Sale gas will be metered at a single metering station before delivery to the user.

Delivery of Natural Gas into the Gas Pipeline: The natural gas from the vaporization system will be metered, odorized, and fed into the supply line to the 420 MW power plant and other customers, if any.

Decommissioning of the LNG Terminal

In the event of the expiry of the concession, the Authority is entitled to require the removal or demolition of all assets, including the facilities and other immovable assets of the investors, unless agree otherwise by the Authority. In the event of the early termination, the Authority shall not require the transfer of such assets from the investors.

5.2 SUMMARY OF IMPACT

The identified environmental disturbances and mitigation measures during pre-construction phase are presented in ***Table 5.2-1***, the identified environmental disturbances and mitigation measures during construction phase are presented in ***Table 5.2-2***, the identified environmental disturbances and mitigation measures during operation phase are presented in ***Table 5.2-3*** and the identified environmental disturbances and mitigation measures during decommissioning phase are presented in ***Table 5.2-4***.

TABLE 5.2-1

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING PRE-CONSTRUCTION PHASE

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
1. Environmental Issues			
1.1 Loss of Britney Creek, vegetation cover for project site	The site preparation will clear about 51.53 acres of degraded forest, about 12.88 acres of natural mangrove, 46.63 acres of swamp area (part of Britney Creek), and 12.96 acres of beach forest . However, the project site has no endangered flora and fauna species.	Medium	• Survey and record flora and fauna species in the Project site before land clearing. If endangered flora and fauna species are found, they should be moved to protected swamps and mangrove areas. • The mangrove rehabilitation program should also include mangrove reforestation to expand mangrove area which serves as natural sanctuaries for marine ecological resources. • In consultation with concerned authorities such as MONREC, Forest Department, and Local Villagers, design and implement a mangrove reforestation program in areas outside DSEZ. The purpose is to compensate for the loss of mangrove area by the Project. • After mangrove reforestation program is already accept by concerned authorities and local villagers, the Project must implemented follow the acceptable mangrove reforestation program. MONREC will support in this program include: ➢ Inspection the implementation of the project must be follow acceptable mangrove reforestation program. ➢ Cooperate with project developer during site survey in project land clearing site and the proposed mangrove reforestation area. • Green buffer zones should be created around the boundaries of the Project site. • Tree cutting will be avoided and cannot be done without prior permission from the Project Proponent's Project Manager.
1.2 Fugitive dust	Fugitive dust generated during the pre-construction phase will mostly result from the following sources: 1) Site clearing including removal of vegetation and top soil; 2) Site filling and compaction; 3)Movement of heavy vehicles on unpaved roads and surfaces; and 4)Deposition of dust from haulage trucks onto local roads.	Medium	• Spray water at and around the construction areas and access roads during site preparation and grading. • Enforce a speed limit for vehicles and trucks in the construction sites not to exceed 40 km/h. Construction activities shall be kept as planned so that the disturbed areas will be minimized at any time. • Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance. • Prohibit open burning of waste in the construction area. • Enforce speed limit for trucks not to exceed 40 km/h when passing the communities. • Cover construction materials with canvas or equivalent during transportation, materials should be dampened, if necessary, before transportation. • Establish a vehicle washing facilities to minimize the quantity of material deposition on public roads. • Establish a checkpoint at project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions.

TABLE 5.2-1

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING PRE-CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
1.3 Impacts from Gaseous Emission	Increase exhaust gas emission from heavy equipments and vehicles	Low	• Adopt procedures to avoid vehicles from leaving the engines idle longer than 5 minutes if they have to queue to enter the construction site; • Maintain all equipment and vehicles in proper working conditions according to the manufacturer's specifications. The engines of construction equipment fleet must be routinely maintained by qualified mechanics to ensure their proper conditions during operations. • Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines). • Take measures to avoid congestion of trucks in areas near communities along the transport routes. A good traffic management plan will be required.
1.4 Noise	Increase noise level from land clearing, land filling activities and mobile equipment.	Medium	• Provide detail of construction activities to concerned authorities and local villagers. • Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures. • Speeds of vehicles in the construction site will not be more than 40 km/hr. • Noise performance requirements of construction equipment will need to be clearly stated in contract specifications. • According to the existing condition of Noise Level at Nga Pitat Village, the results indicate that the noise level is higher than National Noise Level Quality Standard, National Environmental Quality (emission) Guidelines 2015 (Dry Season: 50.8-60.9 dB at day time and 50.5-60.5 dB at night time. Wet Season: 44.2-71.3 at day time and 50.5-60.5 dB 54.1-67.1 at night time). Therefore, the EPC contractor should be monitor before project construction to setting baseline data of noise levels. • The EPC contractor will be required to regularly monitor ambient noise levels at the receptors (e.g. Nga Pitat Village), particularly during the noise generation period such as piling and setting project facilities to checking the noise level at receptor should be within National Noise Level Quality Standard, National Environmental Quality (emission) Guidelines 2015, Myanmar (55 dB at day time and 45 dB at night time) or within existing data that measuring before construction phase. • If the noise level is exceeded than standard or existing data and received complain from local villagers, the project must be consider to setting temporary sound barrier to reduce impact from noise level to local village. • The EPC contractor will be required to regularly monitor ambient noise levels at the receptors, particularly during the noise generation period. • The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the none compliance of noise performance.

TABLE 5.2-1

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING PRE-CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
1.5 Site Clearing Wastes	The entire 124 acres of the Project site will have to be clear of vegetation, thus generating a sizeable quantity of biomass which will have to be disposed. The quantity of biomass from the land clearing is roughly estimated at about 8,354.30 tons	Medium	• Arrangements should be made to enable local villagers to harvest woods for timber or charcoal making before the site clearing operation. Alternatively, the vegetation wastes should be separated into usable timber and woods, and small boughs, twigs, and leaves that will need to be disposed. The separated timbers and woods could be sold or given to villagers. The unusable wastes will be disposed of in a landfill site to be selected by the contractor with approval of the concerned authority. • Alternatively, chipping and mulching of unusable vegetation wastes should be carried out. The mulched materials could be later used for landscaping purposes. • Open burning will not be permitted.
1.6 Road Traffic	Increase number of vehicles (approx. 1 truck /hour for transport biomass wasted) may increase chance on road damage and accident to local villagers.	Medium	• Consultation with the concerned authorities at the national, regional, and township levels on develop and implement a Construction Traffic Management Plan t • Measures to manage the operation of the construction truck fleet for incorporation into a Construction Vehicle management sub-plan. • Post warning signs along the right of way where the access road construction takes place. • Implement management measures to avoid, or minimize increase in traffic caused by the project works in local streets as practicable; • Notify the local community about proposed changes to local traffic access arising from construction activities, and provide clear signage of changed traffic conditions and take other measures to ensure safe traffic movement; • Employ local people a Nga Pitat village to give a sign when local villagers walk across the road during pre-construction • Prepare and implement an employee parking policy for the construction work sites to manage the impacts on car parking in the vicinity of worksites and help avoid project parking in local streets

TABLE 5.2-1

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING PRE-CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Social Issues			
2.1 Impacts on Livelihood of Villagers	Permanent Impact on Villagers in Nga Pitat Village near the Project site, harvest fish and other resources due to loss of the Britney Creek and mangrove in the Project site.	High	• The Project Proponent intends to develop Chi Oo Klong area inside Pan Din In River to provide the new ground for fishing and resource harvesting and the new area for fishing boats berthing. • The Project Proponent will need to prepare a detailed plan for the long term livelihood development of this alternative area in consultation with the affected local villagers and fishermen, and concerned authorities including MONREC, the Fisheries Department at Taninthayi Region, and the Port Department. The long term livelihood development will need approval from these authorities. If justified, supports will be provided to the affected local villagers and fishermen to enable them to adjust to the new fishing ground and boatyard area. • In addition, the Project Proponent should design and implement a livelihood restoration program (LRP) for the affected people in consultation with them and the concerned authorities. - Community forest and mangroves management - Coastal aquaculture within extensive system - Fish processing - Crop cultivation techniques - Product development and marketing - Food preparation and preservation • The affected people should be given preferential treatment in employment in the Project.
2.2 Occupational Health and Safety	Fugitive dust, excessive noise, gaseous emissions, and work safety will be the relevant OHS issues during the pre-construction period. Considering the nature of site clearing works, these OHS issues are relatively easy for the contractor to address.	Low	• The contractor for the site clearing works will need to take appropriate protective measures to minimize workers' exposure to fugitive dust, excessive noise, and gaseous emissions and to reduce the levels of dust, noise and gaseous emissions at the construction site. The workers will have to be adequately briefed on safety aspects of the site clearing works. • The contractor must prepare OHS management plan and implementation procedure specific to this project and in line with its corporate OHS policy and procedure.

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
1. Environmental Issue of Offshore Construction			
1.1 Sea Traffic	During the construction period of 12 months, about 27 vessels will be involved in the construction of offshore facilities. This could have impacts on about 50 fishing boats in Nga Pitat Village. Daily operations of these 27 construction vessels could impede traffic of the local fishing boats.	Medium	• Install signs and warning signs that can be clearly seen (200 m from the construction area) to show the boundaries of offshore construction areas. • All vessels operating in nighttime must receive special permits. • All concerned safety rules have to follow the laws related to transportation section of Myanmar. • Provide information on the boundaries of offshore construction areas and working schedule to all fishing boat operators. • Train all concerned crew on navigation safety in the offshore construction areas. • Carry out routine check and maintenance of vessels to follow safety instructions. • Prepare and maintain readiness for implementing an emergency plan related to marine accidents.
1.2 Increased Turbidity of Coastal Water	- Increase of water turbidity during dredging activities. - The short term increase in seawater turbidity would have no permanent impacts on local fish species considering their mobility and the dredge footprint is not their spawning ground. - As no corals and seagrasses exist within 15 km radius from the offshore construction site, the dredging will affect only small benthic organisms. - The effected from dredging activities to endanger species is negligible due to none of any endanger species found in and around project site.	Medium	**Coastal Water** • The dredged materials will be used to fill the project site. Therefore, measures should be implemented to minimize suspended solids in water to be returned to the sea. Such measures should include bunds surrounding the project site and sedimentation ponds inside the project site. • The dredge contractor will be contractually required to adopt best practices in the dredging operation and management to minimize turbidity plumes. Examples of best practices include the following: - Conduct modeling of the turbidity plumes based on adequate baseline data on water quality around the dredge footprint and near the disposal area, and on climatic conditions, waves and currents. The contractor would need to systematically collect additional water quality data to supplement the existing data. - Design an optimized dredging program to minimize turbidity plumes using the turbidity plume model as the planning tool. - Conduct modeling of the turbidity plumes under various environmental conditions and dredging strategies. - Design a surveillance monitoring program, corrective and reporting mechanism. Threshold turbidity values will need to be established for controlling the dredging operations and adjusting the dredging plan. For example, a maximum threshold turbidity of 50 mg/L may be adopted for suspending the dredging operations. - Daily check and maintenance of sediment transfer pipe to ensure proper pipe conditions and no sediment spills into the sea. - Daily check and maintenance of dredgers and other equipment to minimize dredged material spills.

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
1. Environmental Issue of Offshore Construction (Cont'd)			
1.2 Increased Turbidity of Coastal Water (Cont'd)			• Consider timing to dredge at most favorable points in the tidal cycle to minimize the turbidity plumes. • Use silt curtains where practicable. • Consider timing of dredging to avoid sensitive periods for marine animals. **Marine Ecology** • Apply the same mitigation measures as recommended for coastal water quality and wastewater. • Provide information on the construction schedule and construction area to local fishermen living near the port such as Pan Din In, Sakhanthit, Muangmagan and Nga Pitat villages. • Coordinate with local authorities to protect coral and other marine resources.
2. Environmental Issue of Onshore Construction			
2.1 Noise	During the construction, noise will be mostly generated in civil works construction by operations of heavy construction equipment and pile driving equipment. The construction noise levels will affect construction workers and could also affect the nearby receptors.	Medium	**Physical Measures** • Possibilities are limited for reduction of noise levels of construction equipment. The EPC contractor and the subcontractors may rent construction equipment from suppliers and would not be at liberty to improve them. It is difficult to design practicable noise retrofit kits to endure the environment of the construction sites. Therefore, the EPC contractor and his subcontractors should be required to use equipment that has best noise performance. • For piling, the EPC contractor should be required to use the piling method that has less noise compared to the percussive piling. If necessary, bored piling method should be considered. This method of piling consists of drilling a bore hole down to the required depth. Then a precast spun pile is inserted into the bore hole. Cement slurry is then poured into the bore hole to fix the inserted pile and provide friction. This method of piling generates noise during the soil boring. The noise emanates from the engine driving the boring machine. The noise level is generally lower than 75 dB(A) • During the period of other construction activities, net noise level at the site perimeter will have to be reduced by 15% to 20% if percussive piling is to be used, or by 11% to 16% if vibratory piling is to be used. • Provide ear plugs or ear muffs to workers operating in the excessive noise areas.

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Environmental Issue of Onshore Construction (Cont'd)			
2.1 Noise (Cont'd)			**Management Measures** The following management measures should be implemented to complement the physical measures. • Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures. • Speeds of vehicles in the construction site will not be more than 40 km/hr. • Noise performance requirements of construction equipment will need to be clearly stated in contract specifications. • The EPC contractor will be required to regularly monitor ambient noise levels at the receptors (e.g. Nga Pitat Village), particularly during the noise generation period such as piling and setting project facilities to checking the noise level at receptor should be within National Noise Level Quality Standard, National Environmental Quality (emission) Guidelines 2015, Myanmar (55 dB at day time and 45 dB at night time) or within existing data that measuring before construction phase. • If the noise level is exceeded than standard or existing data and received complain from local villagers, the project must be consider to setting temporary sound barrier to reduce impact from noise level to local village • The EPC contractor will be required to regularly monitor ambient noise levels at the receptors, particularly during the noise generation period such as piling. • The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the noncompliance of noise performance.
2.2 Fugitive Dust	Fugitive dust from the construction of Project facilities will mostly result from site preparatory works. The problem of fugitive dust during the construction will be less significant than during the pre-construction phase.	Medium	Mitigation measures for fugitive dust control during the pre-construction phase will also be applied to the control in the construction phase.

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Environmental Issue of Onshore Construction (Cont'd)			
2.3 Gaseous Emissions	Diesel-powered heavy construction equipment, vessels, vehicles and generator sets are the major sources of gaseous emissions during the construction. Gaseous emissions during the construction phase will create local air pollution confined within the construction sites. The receptors will be construction personnel.	Low	• Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites; • Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. • Provide adequate training to the equipment operators in the proper use of equipment. • Use the proper size of equipment for the job. • Use the equipment with engines that have latest low emission technologies (repowered engines, electric drive trains). For example, the diesel generator set to be used must be equipped with modern pollution control equipment. • Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines). • Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes. • Take measures to manage the movement of construction vehicles entering and leaving the construction sites to avoid, or mitigate and manage the potential for vehicle emissions impacting on adjacent properties.
2.4 Increased Road Traffic	Increase number of vehicles (approx. 38 vehicles/day) may increase chance on road damage and accident to local villagers.	Medium	• Consultation with the concerned authorities at the national, regional, and township levels on develop and implement a Construction Traffic Management Plan • Measures to manage the operation of the construction truck fleet for incorporation into a Construction Vehicle management sub-plan. • Heavy trailer trucks transporting heavy and large plant equipment will have to be directed by a traffic police car. • Post warning signs along the right of way where the access road construction takes place. • Implement management measures to avoid, or minimize increase in traffic caused by the project works in local streets as practicable; • Notify the local community about proposed changes to local traffic access arising from construction activities, and provide clear signage of changed traffic conditions and take other measures to ensure safe traffic movement; • Employ local people a Nga Pitat village to give a sign when local villagers walk across the road during construction • Prepare and implement an employee parking policy for the construction work sites to manage the impacts on car parking in the vicinity of worksites and help avoid project parking in local streets

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Environmental Issue of Onshore Construction (Cont'd)			
2.5 Construction Wastes Including Wastes from Worker Camp	During the construction of Project facilities, the following waste materials will be generated: • Excavated materials from earth works (rocks, soil) • Construction material debris (concrete, wood, scrap metal) • Hazardous waste (empty fuel drums, used oil filters, batteries, spent solvents, oils) • Domestic wastes from site workers (food waste, waste paper, packaging)	Medium	**(1) Waste Reduction at Sources** In general, reduction of construction wastes at sources could be achieved through good design and best practices in construction management. Of relevance to this Project is waste reduction at sources through best practices in construction management. The construction will adopt the following practices to minimize waste quantities at sources: waste segregation, waste collection and storage, waste reuse and recycling, waste disposal, and on-site record keeping. ***Waste Segregation*** • The Contractor will design and implement a waste segregation system and procedure and communicate it to all construction personnel to strictly adhere to the segregation procedure; • An appropriate number of containers with adequate volume and appropriate materials will be provided at strategic locations to support the segregation. Each waste category will be segregated into recycling, reuse and disposal sub-categories. ***Waste Collection and Storage*** • Daily collection and transport will be organized and carried out for each sub-category of segregated wastes; • A roofed storage area with adequate space will be provided for storing the segregated wastes waiting for the on-site or off-site reuse or recycling; • The storage area for hazardous waste will need to be specially designed to prevent spills or leaks onto the soil. ***Waste Reuse and Recycling*** • Reuse of excavated material as fill at approved fill sites; • Collection and return of packaging materials (e.g. pallets) to suppliers wherever practicable; • Use of recycled materials to the limits of design in concrete, road base, asphalt and other construction materials; • Remove any contamination inadvertently deposited in recyclable waste material containers. Provide cleanup of excessive contamination at recycling vendor locations when such contamination is not controlled at the project site; - Collection and recycling of used oils by a licensed contractor; - Collection by a licensed contractor of empty oil and fuel drums and other containers for return to recycling facilities. **(2) Waste Disposal** The remaining wastes that cannot be reused or recycled will have to be properly disposed off properly to minimize environmental impacts. The following approach should be considered:

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Environmental Issue of Onshore Construction (Cont'd)			
2.5 Construction Wastes Including Wastes from Worker Camp (cont'd)		Medium	*General Requirements* • An efficient construction waste management system should be established and implemented. Construction waste will need to be classified and sorted out at source for disposal. The disposal methods will depend on the types of wastes: direct reuse in the construction, sale and recycling of materials, land filling for inert materials and specific treatment method for each type of hazardous materials. • Haphazard disposal of construction waste in or off the construction site will be prohibited. • No burning of wastes will be allowed. *Construction and Land Clearing Wastes* • Construction wastes should be handled by the existing municipal solid waste collection and disposal services. If such service is not possible, the construction wastes would need to be disposed off in the Project site. They may be buried in areas designated for green areas. *Non-construction Wastes* • Non-construction wastes will be disposed off with the construction wastes. • Provide adequate number of refuse bins or containers with tight covers, daily collection of disposal. *Hazardous Wastes* • Hazardous wastes will be handled by a licensed hazardous waste contractor. If this service is not available, the Contractor will need to find appropriate arrangements for incineration, safe permanent storage, or other appropriate methods of disposal. • A Hazardous Waste Management System covering waste classification, separation, collection, storage, transfer and disposal should be set up and operated. The waste management system will comply with applicable regulation of the government, if any.
2.6 Waste Water Management	During the construction phase, the following wastewaters will be generated and need to be controlled: • Domestic sewage generated by daily living activities of about 300 construction personnel at peak of the construction (45 m^3/day) • Wash waters in the construction site, mainly from truck wheel washing and concrete wash waters (42 m^3/day) • Surface runoff (approx. 104,050 m^3.)	Medium	*Waste Water Reduction at Sources* Domestic sewage and wash water will be appropriately treated and reused on site as much as possible to minimize the volume to be discharged into the sea. Wash waters will be treated to remove suspended solids and neutralize, if necessary. The treated effluent will be reused on site as much as possible to minimize the volume to be discharged into the sea. Storm water cannot be reduced and will need to be drained inside the construction site. Therefore, drainage system with retention pond will be proposed to collect storm water and remove suspended solid before discharged into the sea or nearby discharge channel.

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Environmental Issue of Onshore Construction (Cont'd)			
2.6 Waste Water Management (cont'd)			***Treatment and Disposal*** The EPC Contractor will be required to prepare detailed design of a wastewater management system for the LNG Terminal construction site. The wastewater management system will consist of a collection system and a simple treatment system. The proposed design concept is based on the principle of wastewater segregation, treatment and reuse as briefly described below: ***Surface Runoff*** • The site preparation activities, including land clearing and site filling and compaction, should be carried out during the dry season to avoid the problem of surface runoff with high turbidity discharging into the open sea or nearby drainage channels, if exist. • The LNG Terminal construction site should be surrounded by temporary fences to limit the amount of sediment that could be washed from the construction area during the raining time into the sea. • To prevent contamination of the surface runoff, potential contamination sources will be covered with roof. The surface runoff would contain only suspended solids washed out from the open area. • Construct a temporary drainage system to collect the surfaced runoff from the construction area to avoid the discharge of surface runoff into the open sea. • The collected storm water will be drained into a retention pond for removal of suspended solids before discharging into the sea or a nearby drainage channel, if exist. After the construction, the retention pond will be retained and used for wastewater management during the operational phase. ***Domestic Wastewater*** • Toilet wastes will be separated from grey water or salvage. • Kitchen and canteen waste water will be discharged into oil and grease trap tank before draining into a retention pond. • Toilet wastes will be discharged into a septic tank (or more than one septic tank) with a hydraulic retention time of about 5 days. The volume of toilet wastes is estimated at about 20% of the total volume of domestic wastewater, or about 3 m3/d. The septic tank effluent (seepage) will be discharged into the retention pond. Alternatively, toilet wastes and grey water could be treated in a package sewage treatment plant. • Grey water will be discharged into the retention pond. • The retention pond will be designed as an oxidation pond with a hydraulic retention time of about 7 days.

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Environmental Issue of Onshore Construction (Cont'd)			
2.6 Waste Water Management (cont'd)			*Wash Waters* • The concrete wash water and the wheel wash water will be discharged into a concrete settling basin. The effluent will be treated to adjust the pH, if necessary, and reused. The remaining effluent will be discharged into the retention pond. • Water in the retention pond will be used for dust suppression on unpaved areas in the construction site, watering of the green area, concrete washing, and wheel washing.
3. Socio-economic Impacts on Local Communities			
3.1 Local Economy	The Project construction will generate a cash flow of about US$ 24,000 per month from local services, particularly foods and sundries. Thus local economy will be boosted up	Medium	• Priority should be given to local employment, especially the villages close to the construction site; e.g. Nga Pitat, Nyaung Bin Seik and Mudu. • The recruitment process should be fair and transparent and wage rates are commensurate with experiences and qualifications. • The employment conditions will need to comply with the requirements in the national labor law, the social security law and standard wage rate, and other applicable laws and regulations. • The Project Proponent should establish good relationship with the locals and provide the locals with timely information about the project, likely impacts and mitigation measures, and procedures to address local concerns and grievances. • Disclose relevant information before the construction of major components and during the construction through such methods as: - Information billboard - Information disclosure via village headmen or village community leaders • Conduct attitude surveys to collect information on local concerns, issues, and problems of the communities (200 samples within 3 villages and one community).
3.2 Livelihood	This social impact issue will continue from the pre-construction phase to the construction phase. The filling up of the coastal lagoon, Britney Creek, will require the fishermen, mostly in Nga Pitat Village, to move to the new boatyard area to be provided by the Project Proponent, and will deprive them of fishery resources in the lagoon. The Project Proponent will need to continue providing necessary supports, including training, to the affected peoples to assist them in their adjustment to these changes.	Medium	• Continue the implementation of long term livelihood restoration measures proposed in the pre-construction phase. • Continue through provision of knowledge for strengthening occupation career as proposed during pre-construction phase • Conduct attitude survey to collect information on local concerns, issues, and problems of the communities in the new alternative fishing ground and boatyard area (should be all household in Nga Pitat Village)
3.3 Competing Use of Limited Infrastructure and Services	The Project construction could compete with the communities in using limited local infrastructure and services include local road and medical service.	Medium	The EPC contractor should be required to: • Establish first-aid service at the construction site. • Make necessary arrangements for providing medical services to construction personnel.

TABLE 5.2-2

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING CONSTRUCTION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
3. Socio-economic Impacts on Local Communities (Cont'd)			
3.4 Conflicts Related to Differences in Cultures and Traditions	Some construction workers, who came from other areas, personnel, who are not local, could have conflicts with locals related to their differences in cultural and traditional practices and value.	Low	• All project personnel should be made aware of local cultures, traditions and norms. • A code of conduct should be put in place for workers to strictly observe when interacting with locals, including restriction to movement outside of the campsite after designated time. • The Project Proponent should establish good relationship with the locals and actively support and participate in traditional and cultural events. • During the construction, the concerned authorities will be immediately informed if archaeological artifacts are found. • The developer must be discuss with local communities on alternative area for moving of shrine • The moving of shrine must follow with local tradition and developer must be support on moving of shrine
3.5 Community Health, Safety and Security	**Health Risk**: Without proper management, the influx of construction workers could pose health risks to the communities. Communicable diseases such as sexually transmitted diseases, tuberculosis and hepatitis are areas of concern. The EPC contractor will need to design and implement an effective program for control of communicable diseases among the workers. **Security Risk**: The influx of workers could also pose security risks to the communities in terms of crimes and drug abuses. However, as the workers will be mostly hired from local communities, the health and security risks would be small.	Low	**Health Risks** • All recruited workers should receive health examinations for screening of major communicable diseases before employment. Subsequently, annual check-ups should be provided. • Symptoms of major communicable diseases, if noted, should be immediately reported to the district medical officer for proper treatment. • Provide health awareness training to workers on hygiene and sanitation, communicable and infectious diseases. **Security Risks** • All workers should be cleared with the local security authorities regarding criminal records before employment. • The EPC contractor will be required to establish and implement a site security system and appropriate measures, including prevention of drug abuse.
3.6 Cultural and Archeological Sites	There are no known sites of cultural and archaeological significance in the construction site. However, one shrine is located inside the construction site.	Low	• The Project Proponent should consult with the local communities regarding relocation of the shrine to a new location chose by the local communities. The Project Proponent should provide supports to relocate the shrine. • The concerned authorities will be immediately informed if archaeological artifacts are found during the construction.

TABLE 5.2-3

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING OPERATION PHASE

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
1. Environmental Issues			
1.1. Shoreline Stability	Affect the sediment supply from the catchment area and interrupt the sand supply from the estuaries to the beach system. The presence of the two wave breakers will affect the shoreline littoral process resulting in shoreline erosion outside of the northern wave breaker (approx. 1 km north) and shoreline accretion outside of the southern wave breaker.	Medium	• Conduct a regular annual program of beach nourishment using dredged materials from maintenance dredging to fill up the eroded beach along the shoreline. • Construct beach protection structure with steel foundation if high erosion on the shoreline is found. • Based on limited physical and environmental information available, as well as engineering judgment, Regular shoreline monitoring is recommended to gain the necessary information and prepare the setback line or beach erosion protection with hard structure such as groynes if high erosion on the shoreline.
1.2. Increased Turbidity of the Coastal Water and Impact on Marine Ecology	The maintenance dredging will increase turbidity of the coastal water as in the capital dredging during the construction. The magnitude and extent of impacts would be much lower than during the capital dredging. Similar mitigation measures will be adopted.	Medium	• The mitigation measures are similar to those proposed for dredging during the construction phase
1.3. Greenhouse gas	In the estimation, GHG emission of the pipeline transport to the power plant is neglected as the pipeline is only about 1,000 m. For the pipeline of 1,000 km long, the GHG emission is estimated at 0.188 kg CO2-e/kg of transported natural gas. Assuming the emission is directly proportional to the pipe length, the GHG emission for 1 km pipe length of this Project would be only 0.000276 MT CO2-e. If the GHG emission of the upstream production is excluded, the GHG emission of the Project would be only 0.11 million tons of CO2-e, or about 0.11% of the total GHG emission of 98.93 MT CO2-e of Myanmar, excluding GHG emissions from land use change and forestry.	Negligible	• No need mitigation measure and monitoring program

TABLE 5.2-3

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING OPERATION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Social Issues			
2.1 Exclusion Zone	Assuming that the exclusion zone for this Project will be only on port basin, the total water area will be about 96.96 acre. Other vessels including local fishing boats will not be allowed to enter this area.	High	Mitigation measures for this social impact issue should be combined with the mitigation measures for livelihood impacts during the construction phase to form a single livelihood impact mitigation plan. For those affected people who still choose to remain in fishing occupation, a compensation should be considered for their increased travel time and fuel consumption related to routine fishing activities.
2.2 Occupational Health and Safety	OHS issues during the operational phase of Project are relevant to health and safety of operational personnel. Considering the nature of operation of LNG Terminal and facilities, the OSH management system and procedures to be established will need to cover the following issues: Issues Relevant to Unloading Operations • Fire and explosion • Roll-over • Contact with cold surfaces • Chemical hazards ; and • Confined spaces. Issues Related to Storage and Processing of LNG • Physical hazards; • Chemical hazards; • Confined spaces; • Exposure to organic and inorganic dust; and • Exposure to noise.	Medium	Plant Design and Equipment Selection 1) Incorporate in the EPC contract, all OSH requirements that the EPC contractor will, need to consider in the design of the project and associated facilities, including equipment selection. The OSH requirements will cover, but not limited to, the following: (i) integrity of workplace structures; (ii) standard operating procedures for process shutdown, including emergency plan; (iii) work space and exit; (iv)fire precautions; (v) toilets and showers; (vi) potable water supply; (vii) clean eating area; (viii) lighting; (ix) safe access; (x) first aid; (xi) air supply and ventilation; (xii) work environment temperature; (xiii) noise and vibration; (xiv) electrical safety; (xv) fire and explosions; and (xvi) confined working space. 2) The EPC contractor will be required to prepare for consideration of the Project Proponent an OHS management plan and implementation procedures specific to the operations of this Project and in line with the Owner's OHS policy and procedures. The OHS management plan and implementation procedures will be submitted not later than one month before commissioning of LNG Terminal and associated facilities 3) The OHS management plan and implementation procedures will cover but not limited to the following subjects: • Organization and responsibilities of OHS management • Training plan • Communication plan • Contractor responsibilities • Safety measures for the LNG Terminal's O&M, including-safety in project operations, fire, explosion, and chemical hazards. • Emergency response procedures. • Task-specific work requirements Compliance monitoring and evaluation plan • Audit plan • Reporting system • Documentation system

TABLE 5.2-3

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING OPERATION PHASE (CONT'D)

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
2. Social Issues			
2.3. Navigation	Operations of LNG Terminal will invariably increase traffic in the coastal waters within the offshore operational area	Low	• The port will have a vessel traffic management system to ensure navigation safety and keep records of vessels calling at the port. • The navigation area will have adequate number of buoys and signs to clearly indicate the navigation channel and the project boundary.
2.3 Roll-over	Roll-over may occur if LNG stratifies into layers of different densities within the storage tank, resulting in pressures that, in the absence of properly operating safety-vent valves, could cause structural damage in project area.	Medium	• Monitor LNG storage tanks for pressure, density, and temperature all along the liquid column; • Monitoring of total boil-off and heat balance to detect superheating • Consider installation of a system to recirculate the LNG in within the tank; • Install pressure safety valves for tanks designed to accommodate roll over conditions; • Install multiple loading points at different tank levels to allow for the distribution of LNG with different densities within the tank to prevent stratification. • One method is to practice proper transfer procedures to assist in deterring fill-induced stratification. When transferring product into an LNG tank of a different product density, it is prudent to bottom fill the lighter LNG while top-filling heavier product. This procedure will promote a natural mixing of the two product densities
2.4 Static Electric Spark	Static electricity may be generated by liquids moving in contact with other materials, including pipes and fuel tanks during loading and unloading of product. This cause of accident in term of release of gas	Medium	• Implementing safety procedures for loading and unloading of product to transport systems (in this case is vessels), including use of fail-safe control valves and emergency shutdown and detection equipment. • Preparation of a formal fire response plan supported by the necessary resources and training, including training in the use fire suppression equipment and evacuation. Procedures may include coordination activities with local authorities or neighboring facilities • Recommend to setting Prevention of potential ignition sources such as: ➢ Proper grounding to avoid static electricity buildup and lightning hazards (including formal procedures for the use and maintenance of grounding connections) ➢ Use of intrinsically safe electrical installations and non-sparking tools ➢ Implementation of permit systems and formal procedures for conducting any hot work during maintenance activities, including proper tank cleaning and venting, ➢ Application of hazardous area zoning for electrical equipment in design; • Facilities should be properly equipped with fire detection and suppression equipment that meets internationally recognized technical specifications for the type and amount of flammable and combustible materials stored at the facility.
2.5 Livelihood	This social impact issue will continue from the pre-construction phase to the operation phase	Medium	• Continue the implementation of long term livelihood restoration measures proposed in the pre-construction phase. • Continue through provision of knowledge for strengthening occupation career as proposed during pre-construction phase • Conduct attitude survey to collect information on local concerns, issues, and problems of the communities in the new alternative fishing ground and boatyard area (should be all household in Nga Pitat Village).

TABLE 5.2-4

SUMMARY IMPACT ASSESSMENT AND MITIGATION MEASURE DURING DECOMMISSION PHASE

Environmental and Social Issue	Impacts	Control Priority	Mitigation Measures
Decommission Activities	The decommissioning activities include site cleaning, Removal of Buildings, Equipment and Infrastructure, and site rehabilitation would create the following environmental issues: • Disposal of liquid wastes generated in the site cleaning; • Disposal of hazardous materials that are collected during the cleaning; • Noise and fugitive dust generated during the removal of buildings, equipment, and infrastructure. • Site contamination with hazardous materials.	Medium	Planning for the decommissioning will have to be undertaken as soon as the Project Owner decides to decommission the Project. The decommissioning planning will need to consider the following: • Regulatory requirements including EIA and environmental management plan; • Intended use of the Project site after the decommissioning and requirements for rehabilitation of the Project site; • Potential use of the offshore facilities, particularly the jetty and the wave brekers, for other purposes; • Potential to reuse or recycle material and equipment before considering disposal. • Best practicable methods for site cleaning, demolition of buildings and infrastructure, and dismantling of pipe and equipment with least environmental impacts; • Best practicable technologies (BPT) for waste treatment and disposal including hazardous wastes; • Decommissioning tasks and schedules; and • Environmental management plan • Institutional arrangement for decommissioning supervision and environmental impact management, including monitoring.

CHAPTER 6

CONSTRUCTION PHASE EMP

CHAPTER 6

CONSTRUCTION PHASE EMP

6.1 OBJECTIVES OF THE CEMP

For the Project Proponent, the objective of environmental management of Project construction is to ensure that the construction will not create significant impacts and will meet all applicable standards and guidelines and requirements prescribed as conditions for issuing an Environmental Compliance Certificate (ECC). The standards, guidelines and requirements will be prescribed in the Contract.

The key objective of the Owner-CEMP (OCEMP) is to establish a clear operational framework and requirements for environmental management during the construction phase of the Project. Based on the OCEMP, the Contractor will prepare a Contractor-CEMP (CCEMP) which will have operational details based on the detailed designs, construction methods, and construction schedule. The CCEMP will therefore be part of the Contract.

6.2 MAPS

Project construction will take place at one site. ***Figure 6.2-1*** is a base map of the main construction site and villages within 5 km radius. The site layout plan is shown in ***Figure 5.1-1*** and ***Figure 5.1-2*** of ***Chapter 5***.

6.3 IMPACTS AND MANAGEMENT PLANS

Types, magnitudes, durations, and locations of environmental impacts during construction vary as the construction progresses. ***Table 6.3-1*** shows anticipated environmental impacts during 15 months of the construction period.

The following issues will be managed during the construction phase: (1) general construction, (2) mangrove management (3) air quality management, (4) noise, (5) dredging and disposal, (6) waste management (include site clearing waste, construction waste), (7) wastewater management, (8) hazardous waste management, (9) navigation management, (10) traffic management,(11) OHS management, (12) natural resource used management (13) social environmental management (14) cultural tradition management (15) Emergency Management Plan (Flood, Tsunami, and Cyclone), and (16) Emergency Management Plan In Case of Fire Accident; The sub plans are presented in ***Appendix 6A***. Each sub-plan will be a working document and as such it will be reviewed and amended or updated as deemed necessary to reflect changes in construction schedule and management review changes.

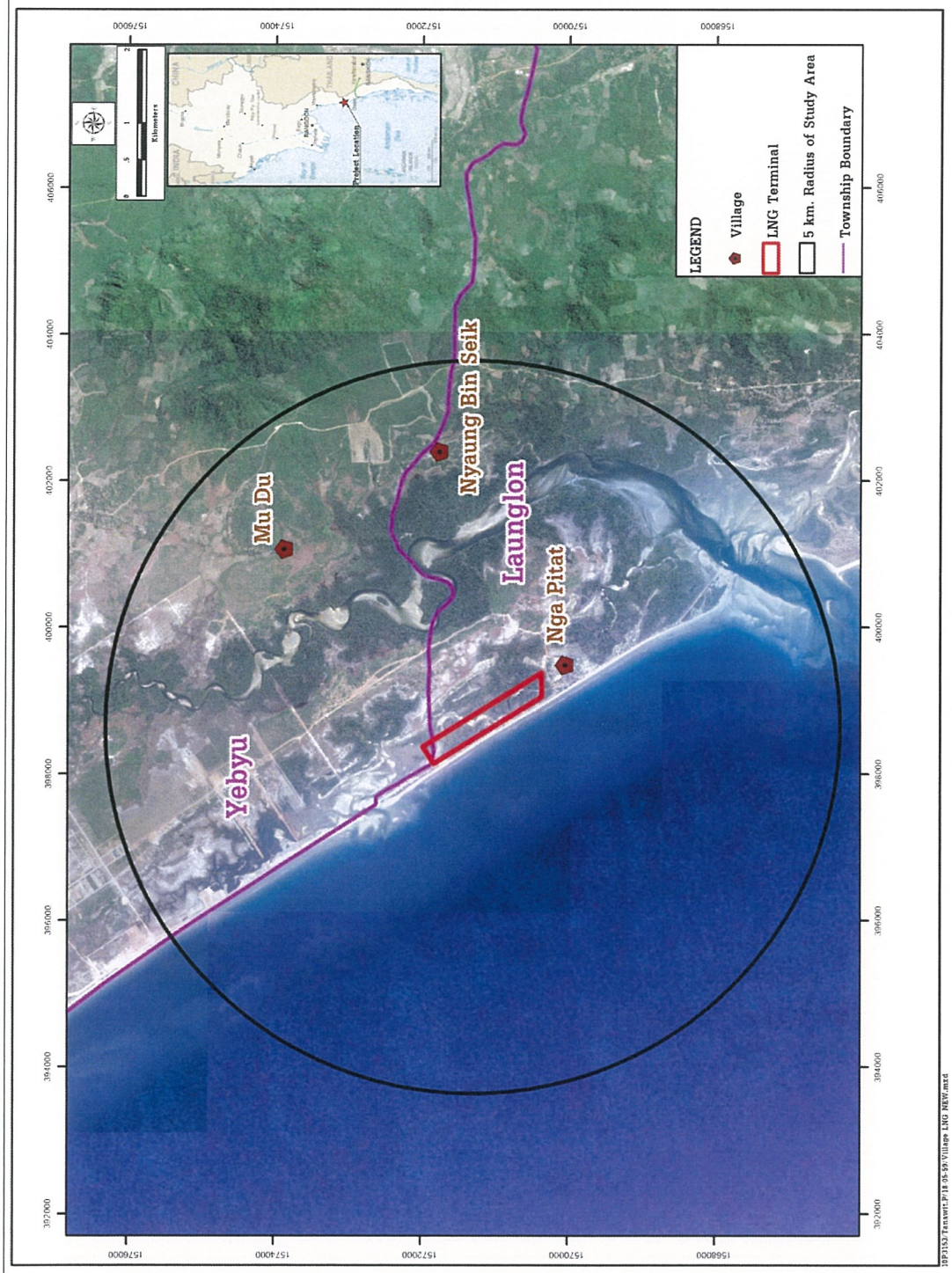


FIGURE 6.2-1 : THE PROJECT CONSTRUCTION SITE AND SURROUNDING VILLAGES

TABLE 6.3-1

ANTICIPATED IMPACTS OF THE PRE-CONSTRUCTION AND CONSTRUCTION

Construction Activities	Impacts
Onshore Preparation	Dust, Noise, Wastewater, Solid Waste, Road Traffic, Mangrove, Social Livelihood, and Cultural Heritage
Dredging Activities	Coastal Water and Marine Ecology, and Sea Traffic
Breakwater and offshore construction	Coastal Water and Marine Ecology, and Sea Traffic

Note : Duration of activities based on tentative project implementation schedule in ***Chapter 4*** of main text.

6.4 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

The Project Proponent and the Contractor will both be involved in environmental management of the Project construction. The Contractor will select construction methods or practices that have least environmental impacts, thus meeting environmental performance targets prescribed in the Contract. During the construction, the Contractor will implement, under supervision of the Project Proponent, impact mitigation measures prescribed in the Contract.

The Project Proponent and the Contractor will have to establish and operate their own environmental management systems (EMS) for the Project construction. The two EMSs will be related and based on the same information base. The Project Proponent's EMS will be focused on monitoring and reviewing environmental compliance at the Project level as part of the Project management. The Contractor's EMS will be focused on environmental management at the task level as part of the construction management. The two EMSs will therefore be complementary and will enable the Contractor and the Project Proponent to complete the Project construction with no significant environmental impacts.

The EMS of the Project Proponent will adopt the following procedures:

6.4.1 Monitoring, Evaluation and Reporting

6.4.1.1 Scheduled Environmental Monitoring and Evaluation

Before commencing the construction, the Contractor will review and update existing data on relevant baseline environmental condition, particularly at locations expected to be affected by the construction.

Scheduled monitoring of environmental performance is required throughout the construction phase of the Project to evaluate compliance with legal requirements, the environmental management objectives, and relevant policies, standards and guidelines. The monitoring and evaluation will enable the overall effectiveness of the environmental controls to be determined and allow areas of non-compliance to be identified so corrective actions can

be taken. The environmental monitoring plan for each issue to be managed is also presented in each sub-plan.

Environmental monitoring will be undertaken according to the following:

- The Contractor's Environmental, Health and Safety (EHS) Manager is responsible for implementing the monitoring plans, and arranging training and specialist consultants for the monitoring as required.
- The monitoring will be conducted by the Contractor using the approved methods stated in the Contract.
- Environmental results not meeting the required standards will be managed as per the corrective action process and issued with a non-compliance report.
- The EHS Manager will advise the Contractor Project Manager of any non-compliance from monitoring and will report these to the Owner's EHS Manager as required.

6.4.1.2 Site Inspections

In addition to scheduled environmental monitoring, the Contractor's EHS Manager will conduct daily, weekly, and monthly general inspections at the construction site. The objectives are to early identify or detect factors which, if unattended to, could result in major environmental events and/or non-compliance. A general scope of inspections is outlined below in ***Table 6.4-1*** and it will need to be updated when the detailed construction plan is made.

The daily inspections will be informal visual inspections to observe conditions of the construction sites. The focus will be on the LNG Terminal construction site where construction activities are concentrated.

The weekly inspections will be formal visual inspections in more details than the daily inspections.

The Contractor's EHS Manager will be responsible for the daily and weekly site inspections. The Owner's EHS Manager will participate in the weekly site inspections, and occasionally in the daily site inspections.

The monthly inspections will be conducted in more detail than the weekly inspections. The monthly inspections will also include risk triggers identified in the environmental risk management plan. The monthly inspections will be conducted jointly by personnel from both sides, including the Project Managers, the Construction Manager and the EHS Managers.

TABLE 6.4-1

OUTLINE OF SITE INSPECTION PLAN FOR CONSTRUCTION

Inspection Focus	Daily Inspection	Weekly Inspection	Monthly Inspection
1. Onshore			
1.1 Project Clearance	√	√	√
1.2 Land Leveling	√	√	√
1.3 Sanitation Condition of Worker Camp, Canteen, Office, Construction Site		√	√
1.4 Storage of Construction Material and Hazardous Material		√	√
1.5 Fugitive Dust	√	√	√
1.6 Ambient Noise Level	√	√	√
1.7 Safety in Work Place	√	√	√
1.8 Drainage	√	√	√
1.9 Traffic Accident	√	√	√
1.10 Wastewater Disposal	√	√	√
1.11 Risk Trigger			√
2. Offshore			
2.1 Coastal Water Quality and Marine Ecology	√	√	√
2.2 Navigation Accident	√	√	√
2.3 Safety in Work Place	√	√	√
2.4 Risk Trigger			√

6.4.2 Environmental Incidents

6.4.2.1 Definition of an Environmental Incident

In addition to scheduled environmental monitoring, the monitoring will also cover environmental incidents. An environmental incident during Project construction is an occurrence which has (or potentially could have had) a negative or adverse effect on the environment. An adverse effect is something that causes (or could have caused) environmental harm. An environmental incident can also be a deviation from a requirement or practice prescribed in this CEMP and the Contractor CEMP. This means there has been a failure to follow the established process or procedures that help the Project achieve best practice (e.g. failure to report a spill). Some environmental incident could create an emergency, i.e. its impact is so serious that it has to be promptly dealt with. Potential environmental incidents and emergencies are identified in the environmental risk assessment for the construction phase in ***Chapter 5***.

6.4.2.2 Environmental Incident Form

An environmental incident, once noted, has to be recorded in an Environmental Incident Form (EIF). A standard Environmental Incident Form (EIF) template will be used for all site specific activities throughout the construction of the Project. An Environmental Incident Form is proposed in ***Appendix 6B***.

6.4.2.3 Environmental Incident Register

The Contractor's EHS Manager will input all data from completed EIFs as soon as possible to generate an Environmental Incident Register (EIR). A standard Environmental Incident Register (EIR) will be controlled by the Contractor's EHS Manager. It will contain all environmental incidents occurring on the construction sites of the LNG Terminal, transmission line, gas pipeline, and access road. The EIR will be discussed regularly at the project environmental performance review meetings. These meetings will discuss the corrective actions taken, and the preventative measures that have been put in place.

6.4.3 Monitoring Reports

Two types of monitoring reports will be generated in the environmental monitoring and site inspections. The first type is reports generated for internal use to provide feedback to the EMS. The second type is reports generated for submission to Ministry of Natural Resources and Environment Conservation (MONREC), Port Authorities, and other concerned authorities, which will be disclosed to public as prescribed in Chapter IX of the ESIA Procedure.

6.4.3.1 Internal Monitoring Reports

Site Inspection Reports

The Contractor's EHS Manager will record results of the daily inspections in daily site inspection notes. The Contractor's EHS Manager and Construction Manager will review the daily site inspection notes on a weekly basis to confirm that the checks and subsequent required works are being carried out, and additional inspections are included as per construction progress.

For weekly inspections, the Contractor's EHS Manager will present results of the inspections in weekly site inspection reports for discussion in the weekly project review meetings. Both the daily inspection notes and weekly inspection reports will highlight factors or events that could lead to non-compliance and will need attention of the Contractor's Project Manager.

The Contractor's EHS Manager will prepare monthly site inspection reports as part of the monthly environmental monitoring reports.

Environmental Monitoring Reports

The Contractor's EHS Manager will prepare monthly environmental performance reports for submission to the Owner's Project Manager. The monthly environmental monitoring report will concisely present (i) results of scheduled environmental monitoring and site inspections carried out during the month; (ii) identified non-compliance, if any, and causes of the non-compliance; (iii) complaints received; (iv) environmental incidents; (v) associated investigations and corrective actions taken; (vi) proposed changes to the monitoring plan, if any; and (vii) work program for the following month.

The monthly environmental performance reports will be discussed in the monthly project status review meetings or in separate monthly environmental performance meetings as appropriate.

6.4.3.2 Monitoring Reports for Submission to MONREC

Based on the monthly internal monitoring reports and results of the monthly review meetings, the Owner's EHS Manager will prepare a project environmental monitoring report every six months for submission to MONREC. This report as prescribed in the ESIA Procedure (Article 108,109, and 110) will contain the following:

- Documentation of compliance with all Conditions;
- Progress made to date on implementation of the EMP against the submitted implementation schedule;
- Difficulties encountered in implementing the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties;
- Number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation;
- Accidents or incidents relating to the occupational and community health and safety, and the environment; and
- Monitoring data of environmental parameters and conditions as committed in the EMP or otherwise required.

The monitoring reports should also present the construction progress over the report period.

6.4.4 Corrective Actions

The Contractor will be instructed by the Owner Project Manager to take corrective actions for any identified non-compliance.Taking corrective actions in managing EHS aspect of the Project will have to be a part of project management and use the same procedure for taking corrective actions in managing other aspects of the Project.The procedure proposed in this CEMP will therefore have to be reviewed and revised as necessary to make it similar to the procedure for other aspects of the Project. A single procedure for taking corrective actions should be used in project management.

The Contractor is required to establish own procedure for corrective actions related to EHS non-compliances.

A. Categories of Non-Compliances

Non-compliances cover non-compliance with legal requirements, non-conformance with internal requirements of the Project, inadequate environmental performance, environmental incident, and complaints or grievances received from the public. Non-compliances could be identified from the following:

- External EHS audits;
- Internal EHS audits;
- Site inspection notes and reports;
- Schedule environmental monitoring;
- Complaints, grievance or inquiries registers;
- Environmental incident registers;
- Specific environmental studies and reports;
- Directives from MONREC/ECD or other government authorities;
- Review meetings;
- Recommendations from any project staff member, Contractor or visitors, which are considered by the EHS Manager and the Project Manager to warrant investigation.

B. Categories of Non-Compliances

EHS non-compliances can be identified, ranked and recorded at three levels. Once the level of anon-compliance has been established the appropriate tool shall automatically be selected for closing out the non-compliance. The actions required for each are detailed below; also a temporary work suspension for cause may be enforced in case of Level A or B non- compliances.

Level A: A critical non-compliance situation, typically including material damage to or a reasonable expectation of impending material damage to an ecologically or socially sensitive resource or has the potential for an extreme health and safety incident. Intentional disregard of project standards which may lead to a serious EHS incident is also classified as Level A.

Level B: A non-compliance situation that has not yet resulted in clearly identified damage or irreversible impact to sensitive important resource, or has the potential for a serious health and safety incident. It requires expeditious corrective action and site specific attention to prevent such effects. Repeated Level B non-compliance may become Level A non-compliance if left unattended or are continuously recurring.

Level C: A non-compliance situation not consistent with the original requirements but not believed to present an immediate threat to an identified important resource, community or employee health and safety. Repeated Level C non-compliance may become Level B non-compliance if left unattended.

The non-compliance may also be of a procedural nature where the Contractor has failed to implement specified requirements and actions. In this case, the Contractor may need to take actions to ensure the procedural requirements are effectively implemented.

C. Responsibilities and Process

The Owner's EHS Manager will be responsible for identifying and ranking EHS non-compliances. However, all Project management personnel are encouraged to help identify EHS non-conformance.

The Owner's EHS Manager will take actions according to the category of non-compliances.

For Level A Non-Compliances: The Owner's EHS Manager will report the identified non-conformances to the Project Manager with recommendations on corrective actions and instructions for the Contractor.

For Level B Non-Compliances: The Owner's EHS Manager will issue instructions to the Contractor in consultation with the Project Manager and the Resident Engineer as necessary.

For Level C Non-Compliances: The Owner's EHS Manager will instruct the Contractor to take appropriate corrective actions.

The Project Manager will be responsible for:

- Issuing instructions to the Contractor to take corrective actions within a given timeframe;
- Follow up on corrective actions taken by the Contractor;
- Evaluate the results of taking corrective actions;
- Prepare a non-compliance report to close the case.

The Contractor will be required to conduct an investigation of the non-compliance to determine its root causes and formulate effective actions to correct the root causes.

For Level B and C non-compliances, the Contractor will submit a brief note on corrective actions to be taken to the EHS Manager and the Resident Engineer, if the corrective actions are related to change in construction practices.

For Level A non-compliances, the Contractor will submit a brief report on the results of investigation and proposed corrective actions to the Project Manager through the EHS Manager and the Resident Engineer, if the corrective actions are related to change in construction method.

D. Corrective Action Request

Instructions to the Contractor will be in the form of Corrective Action Request (CAR). The CAR will contain: (i) information sources of non-compliance; (ii) description of non-compliance; (iii) category of non-compliance; (iv) originator; and (v) time frame for corrective actions.

The corrective action requirements will be included in the requirement tracking system of the project management information system.

E. Non-Compliance Report

The EHS Manager will prepare a brief non-compliance report based on the CAR and reports from the Contractor. The non-compliance report will contain: (i) information in the CAR; (ii) corrective actions taken by the Contractor; (iii) implementation period; (iv) results; and (v) recommendation for further actions, if any. The non-compliance report should be in one or two pages in a Form to be designed.

Each and every non-compliance report will be closed out on a progressive basis, until construction is completed.

Non Compliance Report Forms will be verified and closed out by the originator or his designee. Correspondence referring to a proposed course of action shall be referenced and attached to the Non Compliance Report Form as appropriate and stored within the Project Documentation System.

6.5 EMERGENCY RESPONSE PLAN

The Contractor will be required to prepare an emergency response plan to efficiently and effectively cope with accidents and emergencies which may occur during the construction period. Considering the nature and magnitude of the construction and the construction site, the emergency response plan would deal with work accidents and accidental fires. Natural emergency events such as earthquakes and floods would be very unlikely. Consequently, the emergency response plan during the construction would focus on procedures and facilities to deal with work accidents and accidental fires to minimize injuries and loss of lives, damage to properties, and construction delay.The emergency response plan will be a part of the OHS system.Facilities to be provided on site will contain at minimum the following: fully equipped first aid station, fire-fighting equipment, arranged access to emergency services of the local hospital, and direct communication link with local fire brigades and other relevant government authorities and the local police station.

6.6 ARRANGEMENTS FOR OPERATING THE EMS

6.6.1 Responsibilities

There are three key groups with responsibility for environmental management of the Project:

- Project Proponent or Project Owner who manages the Project through a Project Manager;
- Contractor as the party undertaking the construction; and
- MONREC through Environmental Conservation Department (ECD), Port Authorities, and other government agencies at the regional, township and community levels.

Responsibilities of each party in environmental management are as follows:

Project Proponent

The Project Proponent is legally responsible to MONREC and other line organizations responsible for specific environmental issues for environmental performance of the Project as prescribed as conditions in the ECC and other permits.

Specifically, the Project Proponent will have the following responsibilities:

- Supervise closely the Contractor in implementing the Contractor CEMP as an integral part of its project implementation management and construction supervision.
- Submit periodic monitoring reports to MONREC as required in the ESIA Procedure and Port Authorities.

- Notwithstanding the periodic monitoring reports to be submitted to MONREC and Port Authorities, keep MONREC, Port Authorities, and other concerned authorities informed of any serious environmental events and responses to the events.
- Conducting periodic audit of environmental and social performances of the Contractor.

Contractor

The Contractor, including its approved sub-contractors, is contractually responsible to the Project Proponent for environmental performance of the construction as prescribed in the construction Contract.

Specifically, the Contractor will have the following responsibilities:

- Prepare a detailed Contractor CEMP for review and approval by the Project Proponent. The Contractor CEMP should follow the outline prescribed by the Project Proponent as proposed in ***Appendix 6C***.
- Implement the mitigation measures during the construction through construction method statements and work instructions in strict conformance with environmental conducts prescribed in the Contract.
- Ensure that all process and environmental control equipment meet all technical specifications related to their environmental performance.
- Conduct periodic monitoring and reporting of its compliance with the environmental and social performance prescribed in the Contract.
- Ensure that its sub-contractors shall comply with the Contractor CEMP.
- Consistently update the Contractor CEMP and submit the updated version to the Project Proponent for approval.

MONREC and Port Authorities

MONREC is the key agency to monitor and evaluate environmental performance of the Project construction.Other agencies concerned will support MONREC in the monitoring and evaluation of environmental performance of the Project construction.

Other agencies concerned such as Port Authorities will cooperate with MONREC in the monitoring and evaluation of project implementation and environmental performance of the project during pre-construction and construction phases

Organizational Structure

As environmental management will be carried out as part of the Project management, it will be a functional unit in the project management organization. ***Figure 6.6-1*** shows a tentative organizational structure for Project construction consisting of an organizational structure of the Project Proponent and an organizational structure of the Contractor. The two organizational structures will need to be revised as appropriate as the Project moves from the planning stage to the design stage.

(1) Organizational Structure of the Project Proponent

The Project Proponent will establish a Project Management Office (PMO), headed by a Project Manager. The Project Manager will be responsible for the overall Project management to ensure that the Project construction will be completed on time and fully meet the requirements on scope, quality, budget and environmental performance of the Project construction. The PMO will have seven functional units: (i) Contract management and administration; (ii) construction quality control (civil works); (iii) quality control (mechanical and electrical works); (iv) system performance control; (v) environmental, health and safety management; (vi) stakeholder management; and (vii) administrative support.

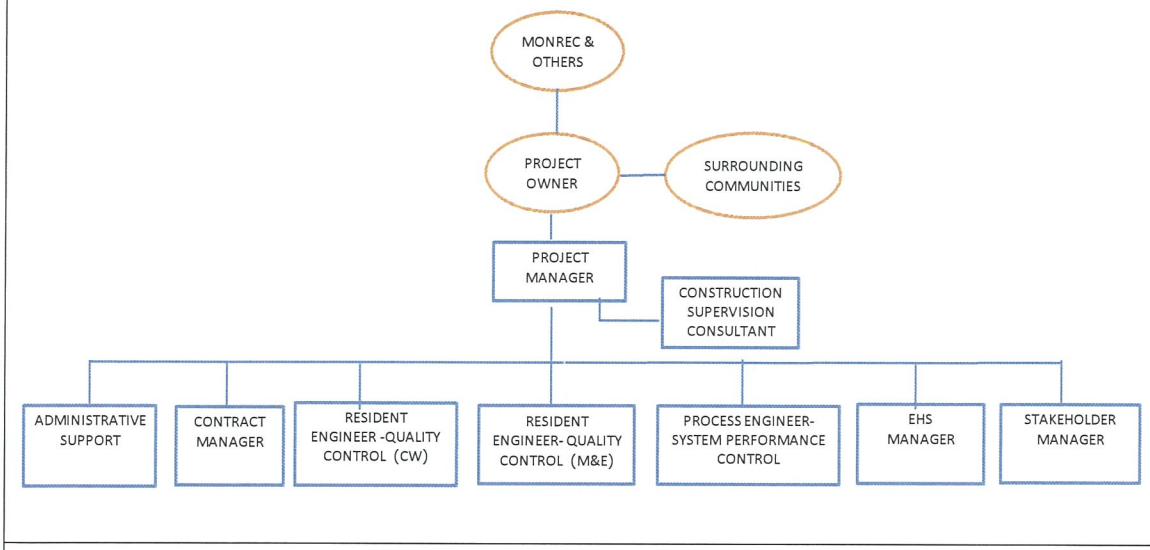
The EHS management and the stakeholder management functions are directly related to the implementation of the Project CEMP. The two functions cover the following tasks or activities:

EHS Management Function:

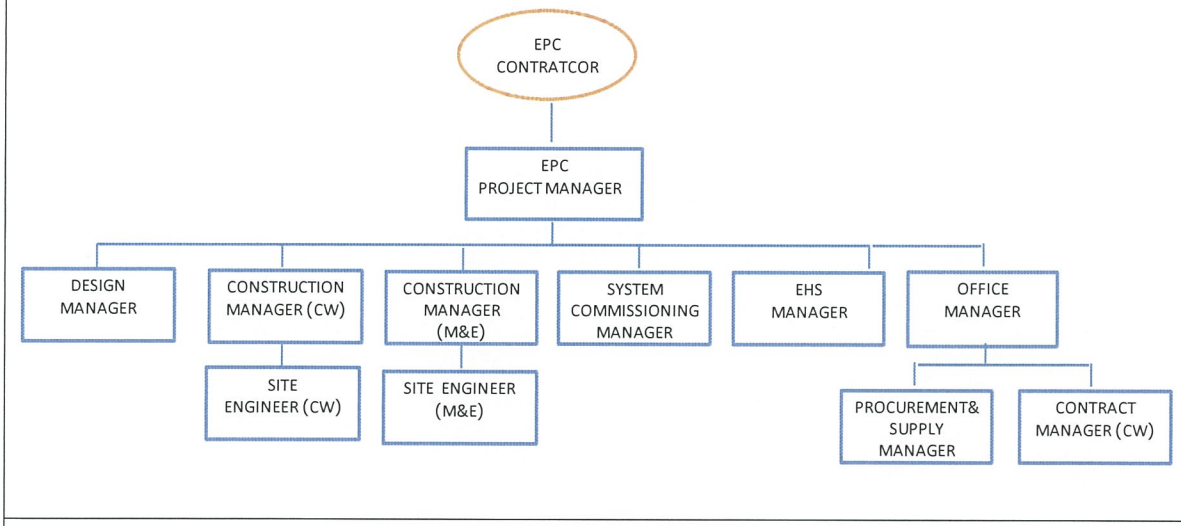
- Review the Contractor CEMP and environmentally-related construction method statements and work instructions prepared by the Contractor;
- Ensure that environmental monitoring activities of the Contractor are properly carried out and will generate reliable data;
- Inspect sites where environmental mitigation measures are implemented;
- Review periodic EHS reports submitted by the Contractor;
- Evaluate the Contractor's environmental performance;
- Prepare Project EHS performance reports;
- In consultation with the relevant quality control functional unit, prepare recommendations to the Project Manager on corrective actions related to environmental performance;
- Coordinating with MONREC/ECD, Port Authorities, and other government agencies concerned regarding monitoring environmental compliance of the Project; and
- Make arrangements to facilitate site inspection by MONREC/ECD, Port Authorities, and other agencies concerned.

Stakeholder Management Function:

- Design and implement an appropriate Corporate social responsibility (CSR) program for the Project;
- Process public complaints in accordance with the public grievance redress process;
- Carry out community and public relation activities to ensure acceptance of the Project by all key stakeholders of the Project; and
- Coordinate with the EHS Manager in making arrangements for site visit or inspection by the Project stakeholders.



PROJECT MANAGEMENT STRUCTURE



GENERAL ORGANIZATIONAL STRUCTURE FOR PROJECT MANAGEMENT-EPC CONTRACTOR

FIGURE 6.6-1 : ORGANIZATION FOR PROJECT CONSTRUCTION

(2) Organizational Structure of the Contractor

The Contractor will establish a Contractor Project Management Office (CPMO), headed by a Contractor Project Manager. The Contractor Project Manager will be responsible for the overall management of Project construction, testing and commissioning of the LNG Terminal and associated facilities to ensure that the Project construction will be completed on time and fully meet the requirements on scope, quality, budget and environmental performance. The Contractor may have a certain organizational structure but the EHS function is required.

The construction management and the EHS management functions are directly related to the implementation of the Contract-specific or Contractor CEMP. The two functions cover the following tasks or activities:

(a) Construction Management Function

- Translate environmental mitigation measures into construction method statements and work instructions for engineers and foremen to carry out;
- Closely supervise construction activities with environmental impacts and implementation of mitigation measures to ensure residual environmental impacts will be within permissible limits;
- Ensure full compliance with all environmental management covenants in the Contract; and
- Coordinate and facilitate environmental monitoring activities of the EHS personnel.

(b) EHS Management Function:

- Review the Project CEMP and prepare a Contract specific CEMP;
- Update the Contractor-specific CEMP as needed to reflect the latest changes in construction plan or schedules;
- Prepare environmentally-related construction method statements and work instructions in consultation with the construction management functional unit;
- Carry out environmental monitoring of construction activities as prescribed in the monitoring schedules in the Contract-specific CEMP;
- Closely supervise the implementation of environmental mitigation measures in collaboration with the construction management functional unit;
- Prepare periodic EHS performance reports for submitting to the Project Proponent;
- Coordinate with the EHS management functional unit of the Project Proponent to facilitate site inspection or visits of officials from MOCEAF/ECD, other government agencies, and representatives of communities in the vicinities;
- Cooperate with the Project Proponent in investigations related to public complaints;

- In consultation with the construction management functional unit, prepare recommendations to the Contractor Project Manager on corrective actions related to environmental performance; and
- Carry out environmental monitoring during the commissioning of LNG Terminal system and prepare an environmental performance report of the LNG Terminal.

It should be noted that environmental management during the system commissioning will be included in the OEMP.The LNG Terminal operation and maintenance team will participate in the commissioning and will take over the LNG Terminal and associated facilities once the technical and environmental performance of the LNG Terminal is accepted.

The Project Management team will support the LNG Terminal O&M team during the transition phase between construction and operational phases. In particular, the Project Management team is responsible for the sign off construction and post construction resource consent and designation conditions, handover of environmental monitoring data and reports and compliance and audit reports before the Project is handed to the O&M team.

6.6.2 Documentation

All documents generated in environmental management and references used will be systematically filed and maintained as part of the Project documentation system. The Contractor is required to design and establish an appropriate documentation system for environmental management as an element of its project documentation system which is an integral element of its project management information system. The documentation system will include an appropriate document control procedure.

The Contractor will ensure that the Project Proponent will have a convenient access to its documentation system for environmental management.The documentation system will provide information for environmental audit of the Contractor. Details on the access to the documentation system and documentation control related to the Project Proponent will be worked out by the Contractor and presented in its CEMP.

6.6.3 Communication Plan

Environmental management of the Project construction will involve communication, both internally and externally. Clear, concise and timely communications are important to the achievement of the objectives of environmental management.

Internal communication will involve: (i) communications within PMO; and (ii) communications within CPMO; and (iii) communications between PMO and CPMO. External communication will involve communications between PMO and stakeholders and the public. Communications between CPMO and stakeholders will need to receive prior concurrence of PMO.

Communications relevant to environmental management of the Project construction will clearly be a part of the project communication.

(1) Objectives of Communication

Internal Communication

The objective of internal communication within PMO and CPMO is to ensure efficiency of environmental management of the Project construction.

The objective of internal communication between PMO and CPMO is to ensure efficiency in monitoring and control environmental management performance of the Contractor, which leads to efficient environmental management of the Project construction.

External Communication

The objective of external communication between PMO and MONREC Port Authorities, and other concerned government authorities is to comply with the reporting requirements prescribed in the ESIA Procedure.

The objectives of external communication between PMO and communities around the Project site as well as mass media and Non-Governmental Organizations (NGOs), if any, are to: (i) ensure adequate and correct understanding of environmental impacts of the Project; and (ii) keep the stakeholders closely informed of the Project's efforts in environmental management and environmental performance of the Project construction. The bottom line is to create trust among the stakeholders in the Project's determination and commitment to environmental management to enable the Project to exist in harmony with the environment and communities.

(2) Topics of Communication

Major topics of communication include:

- Scope of construction;
- Construction schedule;
- Environmental impacts and mitigation measures;
- Environmental policy, objectives, and targets;
- Environmental management roles and responsibilities;
- Legal requirements and environmental quality standards;
- OCEMP;
- CCEMP;
- Results of environmental monitoring and performance evaluation;
- Hazards and emergency situation; and
- Mechanisms for grievance redress, queries, comments, or complaints from stakeholders

As communication involves providing information, information requirements related to the above communication topics for various communicating parties will need to be identified. Internal and external communications will have different information requirements as they have different objectives. ***Table 6.6-1*** presents a tentative information requirements for the internal and external communications.

TABLE 6.6-1

INFORMATION REQUIREMENTS FOR INTERNAL AND EXTERNAL COMMUNICATIONS IN ENVIRONMENTAL MANAGEMENT DURING CONSTRUCTION

Information	Communications	
	Internal	External
Basic Information		
Corporate's environmental policy on project construction	√	√
ESIA Report	√	√
Owner-CEMP	√	√
MONREC's EHS requirements or conditions attached to the issuance of ECC	√	√
Contractor-CEMP	√	√
EHS's specification and clauses in the EPC contract	√	
Construction schedule	√	√
Project EMS	√	
Project management organization-Owner	√	√
Construction management organization-Contractor	√	√
Information Generated in EHS Management		
Daily, weekly and monthly site inspection reports	√	
Environmental monitoring results	√	
Minutes of project review meetings-EHS	√	
Monthly monitoring reports	√	
Minutes of Tripartite Committee's meetings	√	√
Complaints register and response	√	√
Reports on visits by media and stakeholders for environmental purposes	√	
Environmental incident reports	√	√
Corrective action reports	√	√
Biannual monitoring reports submitted to MONREC and Port Authorities	√	

(3) Methods of Communication

The internal communication will use informal communication, formal communication through meetings, and formal correspondence in writing through e-mail or letters, notice boards, and formal notifications or instructions. The methods of communication will follow the methods of project communication.

The external communication will use a variety of methods depending on the purpose of communication and the stakeholders. The methods of communication will follow the methods of project communication.

(4) Responsibilities

Project Proponent

The EMS Manager of the Project Proponent is responsible for:

- Communicating the Project's environmental policy, commitments and procedures to all project management staff;
- Communicating roles and responsibilities for environmental management and the results of monitoring activities carried out by the Contractor;
- External communications with stakeholders under the supervision of the Project Manager;
- Preparing a list of information to be provided in external communication and persons with authority to release the information;
- Recording the external communication on an External Communication Log and tracking any pending matters; and
- Supporting the Project's public relation activities through providing environmentally related information.

The Contractor

The EMS Manager of the Contractor has the following responsibilities:

- Communicating the Project's environmental policy, commitments and procedures to all project management and construction personnel;
- Communicating roles and responsibilities for environmental management and the results of monitoring activities to all personnel;
- Providing information support to the Project Proponent's EMS Manager for use in external communication with stakeholders as well as in internal communication.

(5) Management Review

This CEMP will be consistently reviewed and updated by the EMS Manager or the Project Manager to ensure that it adequately responds to the construction progress and changes in the construction schedule and methods, if any.

6.7 PUBLIC CONSULTATION AND DISCLOSURE

6.7.1 Organization for Public Consultation

A tripartite committee is proposed to be set up by the Project in consultation with the community heads and representatives of the national, regional, and township administrations. The committee should be represented by: (i) the government sector, including MONREC/ECD, Port Authorities, Administration and Concerned Authorities of Tanintharyi Region, Dawei District including Yebyu and Launglon Townships; (ii) villages nearest to the Project site; and (iii) the Project Proponent. Tentatively, the committee should not have more than 12 members; of which 3 represent the government sector, 6 represent the villages, and 3 represent the Project Proponent. The ECD official should be the chairperson and the Project Manager of the Project Proponent should serve as secretariat of the committee. The secretariat will be assisted by the EHS Manager of the Project Proponent as assistant secretariat of the committee.Representatives of the Contractor should participate in the committee meetings to support information.

The tripartite committee should have the following responsibilities:

- Review and comment on the Contractor CEMP submitted by the Contractor to ensure the Contractor CEMP adequately address key concerns or issues raised by the stakeholders;
- Review the periodic monitoring and evaluation reports and, if there are performance gaps, give advices on the most appropriate course of action to fill the gaps;
- Review the periodic reports on issue and grievance management;
- Appoint additional committee members as deemed appropriate;
- Organize public discussion forum for promoting understanding of the Project and the communities' needs, and cooperation among the three parties for mutual benefits; and
- Review and comments on community assistance initiatives of the Project as part of its CSR.

The tripartite committee may appoint two working groups, one on environmental management, and another on social management, to provide technical supports to the committee.

6.7.2 Information Disclosure

Information to be disclosed during the Project construction phase will be monitoring reports as required in Article 110 of the ESIA Procedure shown below.

Within ten (10) days of completing a monitoring report as contemplated in Article 108 and Article 109 in accordance with the EMP schedule, the Project Proponent shall make such report (except as may relate to National Security concerns) publicly available on the Project's website, at public meeting places (e.g. libraries, community halls) and at the Project offices. Any organization or person may request a digital copy of

a monitoring report and the Project shall, within ten (10) days of receiving such request, submit a digital copy via email or as may otherwise be agreed upon with the requestor.

The Owner PMO will make arrangements for the disclosure of monitoring reports in compliance with the above legal requirements. In addition, information on environmental management will be disclosed to the proposed tripartite committee.

6.7.3 Grievance Redress

A grievance redress process will be established and implemented as part of project management by the PMO. The process is shown in a diagram in ***Figure 6.7-1***. Each step of the process is clearly explained in the diagram. The process will enable efficient management of grievance redress or response to complaints related to EHS of the Project construction.

6.8 ENVIRONMENTAL RISK MANAGEMENT

Environmental risk management is to be carried out as part of the Project risk management.***Section 6.6*** on environmental risk assessment identifies and assesses environmental risks during the construction phase. Each major environmental risk will be documented in an Environmental Risk Register (ERR). The ERR is to be maintained and regularly updated and reassessed to allow all significant aspects to be identified. The Risk Register will allow the Project team to monitor risk factors, update the risk assessment, and make changes to the risk mitigation measures and controls accordingly to ensure efficient risk management. It should be noted that an emergency plan is essentially a risk mitigation measure.

6.9 AUDIT

External EHS audits will be undertaken at the end of first year of the construction period and at physical completion of the construction. These two audits will be undertaken by external Environmental Auditing Consultants to review the overall implementation and effectiveness of the CEMP, related site specific plans, procedures and associated documentation and overall standard of onsite compliance with legislative requirements.

Audit reports, action plans and any other documentation stemming from the audit process shall be kept for a minimum of five years.The EHS Manager will be responsible for site filing of these documents.

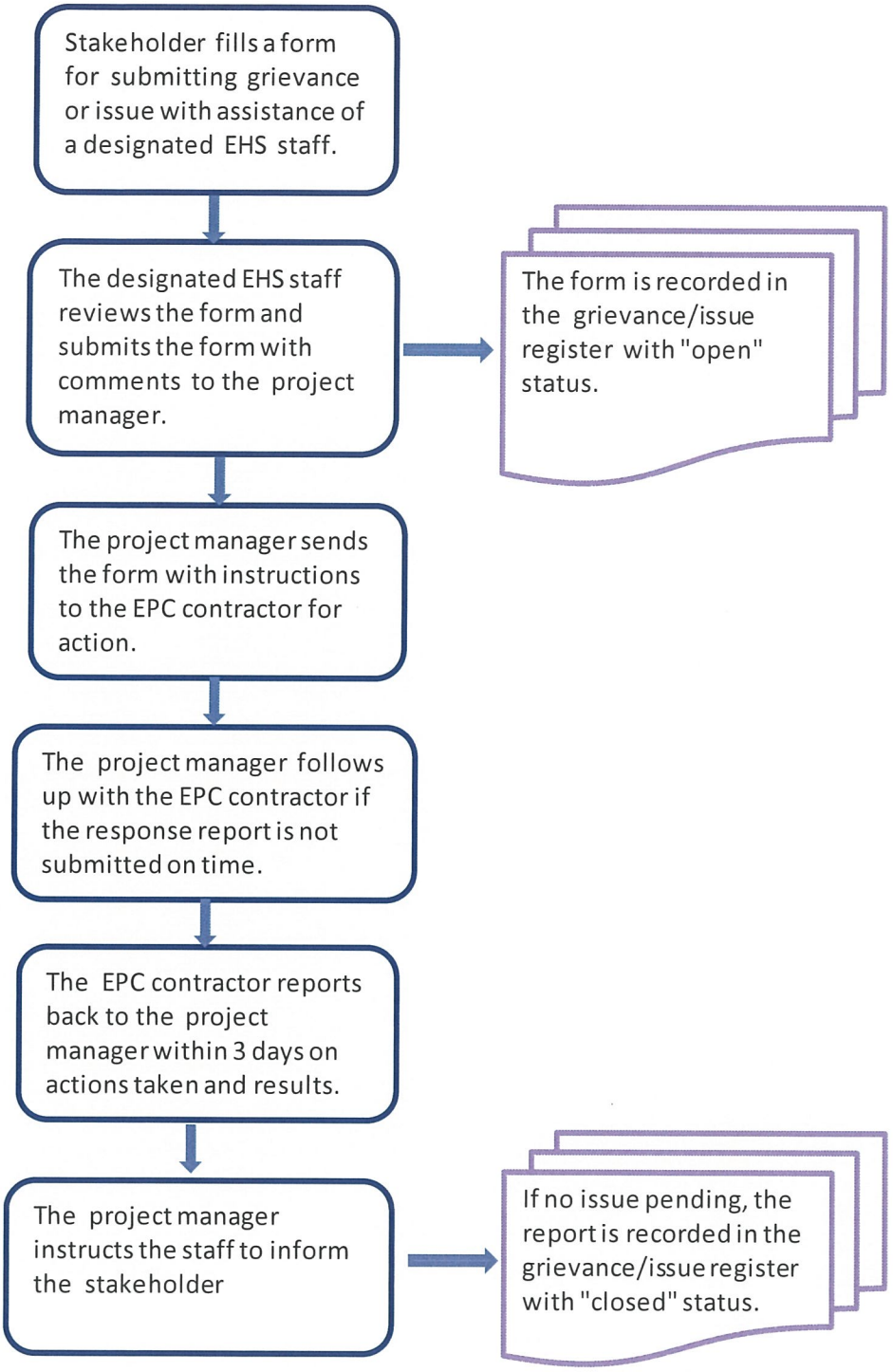


FIGURE 6.7-1 : GRIEVANCE MANAGEMENT PROCESS

CHAPTER 7

OPERATIONAL PHASE EMP

CHAPTER 7

OPERATIONAL PHASE EMP

7.1 OBJECTIVES OF THE OEMP

Environmental management in the operational phase will be carried out by an Operation and Maintenance (O&M) organization to be established by the Project Proponent. The objective of environmental management of Project operation is to ensure that O&M of the LNG Terminal and its associated facilities will not create significant impacts and will meet all applicable standards and guidelines and requirements prescribed as conditions for issuing an Environmental Compliance Certificate (ECC) and the operation permit.

The key objective of the Operation EMP (OEMP) presented in this section is to establish a clear operational framework for environmental management during the operational phase of the Project. The Engineering Procurement Construction (EPC) Contractor will then use this OEMP to prepare a more detailed OEMP which will be based on the detailed designs of the LNG Terminal, results of the commissioning, and O&M details. The detailed OEMP will be reviewed and revised as appropriate by the LNG Terminal O&M team to reflect actual conditions during commercial operation.

7.2 MITIGATION MEASURES AND PLANS

The ESIA study (Volume 1-ESIA Report in Chapter 6) confirms that O&M of the LNG Terminal and its associated facilities will not create any significant environmental impacts. Environmental management in the operational phase will cover the following tasks: (i) scheduled monitoring of mangrove rehabilitation, maintenance dredging and disposal (include coastal water and marine ecology), navigation, shoreline erosion management (ii) OHS management; (iii) implementation of a Social Environmental Management (include Corporate Social Responsibility (CSR)), (iv) implementation of Vessel Traffic and Safety Management, (v) implementation of Emergency Management Plan (Flood, Tsunami, and Cyclone), (vi) implementation of Emergency Management Plan in case of gas leakage, (vii) implementation of Emergency Management Plan in case of fire accidents, and (viii) roll-over and static electric sparking prevention system. ***Appendix7A*** presents sub-plans of the three tasks.

The sub-plans will be working documents and as such they will be reviewed and amended or updated as deemed necessary.

7.3 ENVIRONMENTAL RISK MANAGEMENT

Environmental risk management is to be carried out as part of the LNG Terminal risk management. ***Section 6.7*** on environmental risk assessment identifies and assesses environmental risks during the operational phase. Each major environmental risk will be documented in an Environmental Risk Register (ERR). The ERR is to be maintained and regularly updated and reassessed to allow all significant aspects to be identified. The Risk Register will allow the Environmental, Health and Safety (EHS) Manager to monitor risk factors, update the risk assessment, and make changes to the risk mitigation measures and controls accordingly to ensure efficient environmental risk management. It should be noted that an emergency plan is essentially a risk mitigation measure.

7.4 ENVIRONMENTAL INCIDENTS

(1) Definition of an Environmental Incident

In addition to scheduled environmental monitoring, the monitoring will also cover environmental incidents. An environmental incident during Project operation is an occurrence which has (or potentially could have had) a negative or adverse effect on the environment. An adverse effect is something that causes (or could have caused) environmental harm. An environmental incident can also be a deviation from a requirement or practice prescribed in this OEMP. This means there has been a failure to follow the established process or procedures that help the Project achieve best practice (e.g. failure to report a spill). Some environmental incident could create an emergency, i.e. its impact is so serious that it has to be promptly dealt with. Potential environmental incidents and emergencies are identified in the environmental risk assessment for the construction phase in ***Chapter 5***.

(2) Environmental Incident Form

An environmental incident, once noted, has to be recorded in an Environmental Incident Form (EIF). A standard Environmental Incident Form (EIF) template will be used for all site specific activities throughout the construction of the Project. An Environmental Incident Form is proposed in ***Appendix 7B***.

(3) Environmental Incident Register

The Project Manager will input all data from completed EIFs as soon as possible to generate an Environmental Incident Register (EIR). A standard Environmental Incident Register (EIR) will be controlled by the Contractor's EHS Manager. It will contain all environmental incidents occurring on the construction sites of the power plant, transmission line, gas pipeline, and access road. The EIR will be discussed regularly at the project environmental performance review meetings. These meetings will discuss the corrective actions taken, and the preventative measures that have been put in place.

7.5 MONITORING, EVALUATING AND REPORTING

The MER will include scheduled monitoring of noise, air quality, coastal water and marine ecology, continue monitor on mangrove management, shoreline erosion, navigation.

Coastal water and marine ecology will be conducted twice a year throughout operation phase during dredging activities and after complete maintenance

Continue monitor on mangrove management will be conducted twice a year during 1^{st}-10^{th} year of operation phases to check types and quantity of flora and fauna in mangrove rehabilitation area.

Shoreline erosion monitoring will be conducted twice a year monitor on beach profile and bathymetric survey and monthly checking shoreline erosion at 5 km of north and 5 km of south of beach along the port development

Navigation monitor will be conducted every day in term of accident situation at Access Channel of LNG terminal.

Project proponent should be continue attitude survey at Nga Pitat Village about new fishing ground and boat yard area to ensure the villagers can use natural resource in the new alternative area. The monitoring will be conducted 2 time per year during 1^{st}-5^{th} year and once a year during 6^{th}-10^{th} year of operation phases

The sampling and analysis requirements will be similar to those of the surveys conducted before the commissioning. Annual environmental reports will be prepared for submission to MONREC and other concerned authorities such as Port Authorities Department.

7.6 CORRECTIVE ACTIONS

Corrective actions are described as part of the management of the implementation of the community support. The process is discussed in the sub-plans.

7.7 ORGANIZATION

As environmental management will be carried out as part of the LNG Terminal management, it is a functional unit in the LNG Terminal management organization. ***Figure 7.7-1*** shows a tentative organizational structure for LNG Terminal management, including the EHS unit. The organizational structure will be revised as appropriate in due course by the Project Proponent before the commissioning.

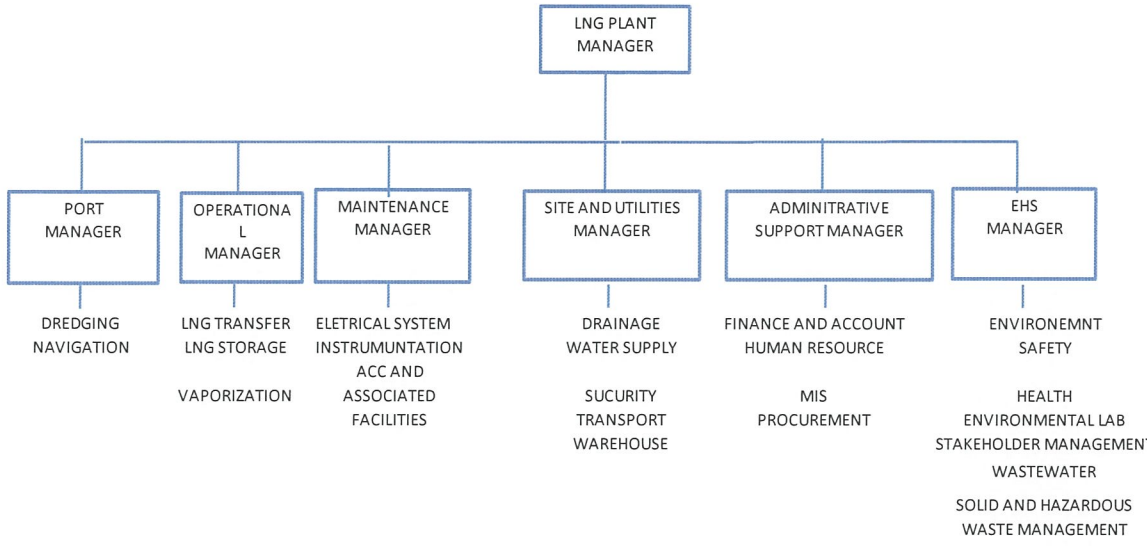


FIGURE 7.7-1 : TENTATIVE ORGANIZATION FOR LNG TERMINAL O&M AND ENVIRONMENTAL MANAGEMENT

7.8 PUBLIC CONSULTATION AND DISCLOSURE

The tripartite committee established during the construction phase should be maintained. However, its role would be more on providing advice in the implementation of the community support plan. The components and responsibilities of the tripartite committee are defined.

7.9 GRIEVANCE REDRESS PROCESS

A grievance redress process is proposed as mechanism for ensuring that public complaints and concerns related to the LNG Terminal operation will be effectively addressed as quick as possible. The process is shown in a diagram in ***Figure 7.9-1***.

7.10 AUDIT

An audit is proposed at the end of the first year of operation and every year thereafter, if necessary.

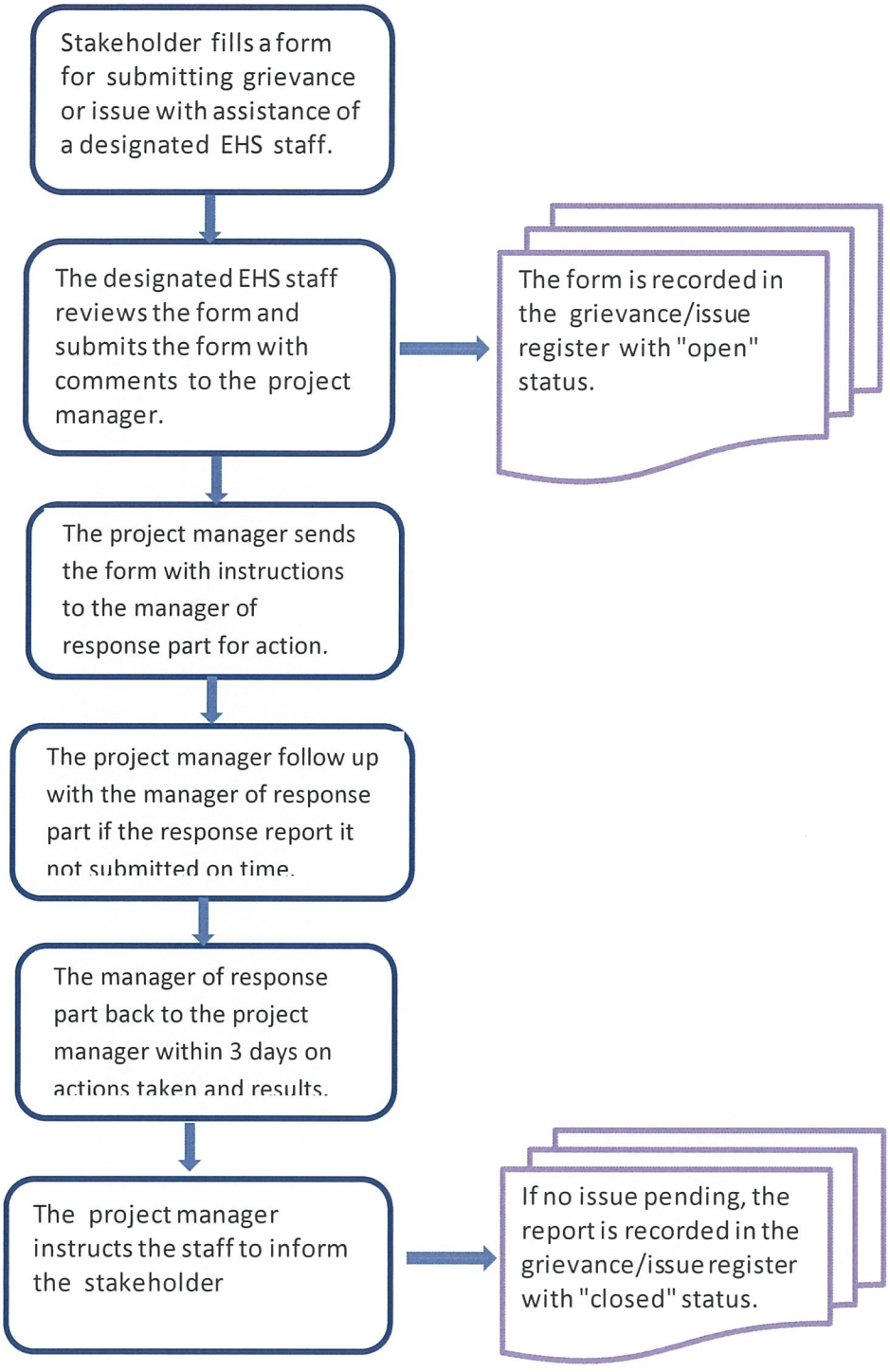


FIGURE 7.9-1 : GRIEVANCE MANAGEMENT PROCESS DURING OPERATION PHASES

CHAPTER 8

EMERGENCY PLAN

CHAPTER 8

EMERGENCY PLAN

According to impact and risk assessment in Chapter 6 of ESIA Report, the emergency plan for tsunami, ship collision, gas leakage, and fire accident must be prepared to protect and minimize impact in case of tsunami, ship collision, gas leakage, and fire accident will appear. The detail of each plan are described as follow:

8.1 EMERGENCY PLAN FOR TSUNAMI AND CYCLONE

Even through the tsunami and cyclone situation have not ever found in the project area, Seismic Hazard Map from Meteorological and Hydrological Department, Myanmar, indicate that the LNG Terminal area is classified as a moderate seismic zone, so impacts from this issue may be low or moderate (Probable range of ground acceleration = 0.1-0.15 g).

With the location near Indian Ocean, the tsunami may occur again similar to the situation in 2004 caused by earthquake in Indian Ocean.

The recommendation about emergency and contingency plan for the LNG terminal in case of cyclone and tsunami protection include:

- Prepare the detail design of LNG Terminal to withstand the cyclone and tsunami.
- Establish and regularly monitor the warning system for tsunami.
- Set the safety zone for evacuation of staff and people in case of tsunami and cyclone.
- Set up the evacuation plan for tsunami and cyclone and train all staff in LNG Terminal.

Refer to the Tsunami Emergency Planning in Australia, 2010, Tsunami emergency plans should cover strategies to be used in preparedness, response and the initiation of recovery for tsunami.

Table 8.1-1 described the concept details of content considerations which may be included in tsunami and cyclone emergency plans. This concept will be required for Project Proponent and Contractor to prepare an emergency response plan to efficiently and effectively cope with accidents and emergencies which may occur in case of Tsunami Situation.

TABLE 8.1-1

CONCEPT DETAILS FOR TSUNAMI AND CYCLONE EMERGENCY PLANS

Phase	Content
Preparedness	• Review of Plans • Establishment and review of tsunami risk assessment / intelligence • Conduct of community education • Establishment and/or maintenance of warning systems
Response	• Control and coordination arrangements • Outline of operational divisions / sectors • Location of operations centres • Warning at-risk communities • Evacuation of at-risk affected communities; including the identification of suitables evacuation routes and shelters • Provision of welfare relief • Pre-deployment of resources to staging areas outside the impact area • Protection of emergency land and marine resources by removing them from likely impact areas • Restriction of access and security of evacuated areas • Reconnaissance / monitoring of potentially affected areas and the undertaking of rapid impact assessments • Rescue of trapped and injured people • Care for sick and injured persons • Disaster victim registration • Disaster victim identification • Establishment of a public enquiry system • Issue of 'all clear'
Recovery	• Initiation of recovery • Recovery coordination • Conduct of after action reviews / debriefs
General	• Description of the risk within the scope of the Plan

Source: Tsunami Emergency Planning in Australia, 2010

8.2 EMERGENCY CONTINGENCY PLAN FOR SHIP COLLISION

In the event of a collision many of the actions to take will depend upon the seriousness of the damage inflicted to either or both of the vessels involved. For example the collision may only involve a glancing blow where the structural damage is superficial, or it might be more serious and followed by a fire, explosion, serious pollution, stranding or foundering, with the possibility of crew overboard, seriously injured or even killed.

The recommendation about emergency and contingency plan for the LNG terminal in case of ship collision include:

- Submit a detailed plan of navigation route to LNG carrier.
- Organize and conduct training of the offshore operational team to be nominated by the Project Proponent in the operation and maintenance and risk management of the LNG terminal. The training will use the work procedures prepared by the EPC contractor. After the training, the EPC contractor will conduct a rigorous test of the trainees to evaluate their technical competencies required for efficient and safe operation and maintenance of the project.

In addition to the insurance, the Project Proponent should require the EPC contractor to prepare an emergency response plan to enable the LNG terminal operational team to promptly cope with the consequences if the operational risk events occur. The content of such plan should include, but be limited to the following:

- Background and Purpose of the Emergency Response Plan
- Types, Nature and Locations of Emergencies (on-site and off-site)
- Emergency Response Organization
- Emergency Response Process and Work Procedures
- Notification Procedures and Communication Systems
- Damage Assessment Process
- Process and Procedures for Returning to Normal Operations
- Emergency Equipment and Facilities Available
- Training, Simulation and Mock-Drills
- Regular Tests of Emergency Organization and Procedures
- Review of Plans and Updates

Appendix 8A described the example of concept of Emergency Contingency Plan for Ship Collision with refer from http://www.liquefiedgascarrier.com/collision-accident.html.

8.3 EMERGENCY CONTINGENCY PLAN FOR GAS LEAKAGE

During the commissioning and operational phases, the another major concerns are on possible hazardous events which, if occur, would seriously damage the LNG Terminal and could cause injuries and fatalities to operational personnel and people in the nearest communities.

Recognized major hazards in LNG terminal include gas leakage and internal explosions.

The recommendation about emergency plan for the LNG terminal in case of gas leakage include:

Measures for Addressing Faulty Design and Defects in the Equipment, Equipment Installation, and Construction

- The EPC contractor should be required to adopt the RAMS process in the design and construction of the power plant and its associated facilities.
- The EPC contractor will ensure that the design, selection of equipment, installation and construction will follow the safety guidelines in the Health and Safety Executive (HSE)'s Guidance Note on" LNG terminals - Consent and operational issues (Detail on ***Appendix 8B***)", as well as applicable supplementary guidelines or standards of other recognized technical organizations such as

i) Design following the Euro Codes

ii) Typical American Design Codes (API etc.)

iii) NFPA 59A (2009) (Standard for the Production, Storage and Handling of Liquefied Natural Gas (LNG))

iv) ISO 28460 (Installation and Equipment for Liquefied Natural Gas, Ship to Shore Interface and Port Operations)

v) EN 1160 (Installation and Equipment for Liquefied Natural Gas, General Characteristics of Liquefied Natural Gas)

vi) EN 1473 (Installation and Equipment for Liquefied Natural Gas, General Characteristics of Liquefied Natural Gas)

vii) SIGTTO

viii) ISPS (International Ship and Port Facility Code)

ix) PIANC Guidelines

- Guidelines for the Design of Fender Systems (2002)
- Criteria for Equipment Guidelines (1995)

x) OCIMF (Mooring Equipment Guidelines)

- The design will include installation of gas leakage detection system as advised in HSE's Guidance.
- The EPC contractor will be required to clearly incorporate operational risk management requirements and proposed designs of mitigation measures in the Project Understanding, the Statement of Criteria, and the Basis of Designs-these three documents would be required by the Project Proponent as part of the design risk management.

- A safety review of the design, proposed equipment, methods of installation and construction should be conducted by the project management team of the Project Proponent.

- The EPC contractor will be required to submit a detailed quality control system for the design, equipment installation and construction focusing on such key operational risk areas as the gas metering station, gas engine enclosure and flare system. The quality control system will need to clearly show the interaction between the EPC contractor and the design consultant and the subcontractors.

- Conduct a detailed hazard and operability study (HAZOP) after the detailed design and specifications are completed. Results of the HAZOP study would support the safety review suggested above.

Measures for Addressing Inadequacies in the Operation and Maintenance Procedures, and Human Error in the Operations and Maintenance

The Project Proponent will, as part of the contract, require the EPC contractor to carry out the following tasks:

- Submit a detailed plan for testing and commissioning of the LNG Terminal. Purging of the ambient air vaporizer and gas piping system must strictly observe guidelines in NFPA 59 (A), Fire and Explosion Prevention during Cleaning and Purging of Flammable Gas Piping System. This provisions prohibit the use of flammable gas during cleaning procedures while safeguarding a range of activities related to cleaning and repairing piping systems. The EPC contractor must prepare a gas-blow procedure for review by the Project Proponent and conduct a training of personnel to ensure correct implementation of the procedure.

- Submit detailed working procedures for the operation and maintenance of various units or facilities of LNG terminal. The procedures will include safety aspect of high risk areas of operations. The working procedures must be certified by qualified engineers with extensive experience in LNG Terminal. The work procedures will be included in the safety review of the Project Proponent.

- Organize and conduct training of the operational team to be nominated by the Project Proponent in the operation and maintenance and risk management of the Project LNG Terminal. The training will use the work procedures prepared by the EPC contractor. The EPC contractor will submit a detailed training program and implement the training not later than two weeks before commencing the testing and commissioning of the LNG terminal. After the training, the EPC contractor will conduct a rigorous test of the trainees to evaluate their technical competencies required for efficient and safe operation and maintenance of the LNG Terminal.

In addition, the Project Proponent would also adopt a risk transfer measure through taking an insurance against the cost of damages to properties, injuries and fatalities, and loss of revenue should the operational risk events occur.

In addition to the insurance, the Project Proponent should require the EPC contractor to prepare an emergency response plan to enable the LNG terminal operational team to promptly cope with the consequences if the operational risk events occur. The content of such plan should include, but be limited to the following:

- Background and Purpose of the Emergency Response Plan
- Types, Nature and Locations of Emergencies (on-site and off-site)
- Emergency Response Organization
- Emergency Response Process and Work Procedures
- Notification Procedures and Communication Systems
- Damage Assessment Process
- Process and Procedures for Returning to Normal Operations
- Emergency Equipment and Facilities Available
- Training, Simulation and Mock-Drills
- Regular Tests of Emergency Organization and Procedures
- Review of Plans and Updates
- Detailed Operating Manuals

This concept will be required for Project Proponent and Contractor to prepare an emergency response plan to efficiently and effectively cope with accidents and emergencies which may occur in case of gas leakage.

8.4 EMERGENCY PLAN FOR FIRE FIGHTING

During the commissioning and operational phases, the another major concerns are on fire accident, if occur, would seriously damage the LNG Terminal and could cause injuries and fatalities to operational personnel and people in the nearest communities.

For this project, the design of protection and emergency plan for fire accident situation and properly number of firefighting system refer from International Standard include:

Myanmar

i) Factories Act (1951), Section 40

ii) Social Security Law (2012)

iii) The Explosive Substance Act (1908), Section 3

iv) Law Related to Fire Fighter (2015)

International

v) NFPA 59A (2013) (Standard for the Production, Storage and Handling of Liquefied Natural Gas (LNG))

vi) NFPA 15

vii) NFPA 20

viii) EN 1160 (Installation and Equipment for Liquefied Natural Gas, General Characteristics of Liquefied Natural Gas)

ix) EN 1473 (Installation and Equipment for Liquefied Natural Gas, General Characteristics of Liquefied Natural Gas)

x) SIGTTO (recommendations)

xi) ISO 28460:2010 "Installation and equipment for liquefied natural gas - Ship-to-shore interface and port operations".

The detail are described as follow:

1. The Fire, Spill and Gas Detection System

➢ Rapidly and reliably detects a LNG spillage (cold detection), a leakage of flammable gas, or a fire condition.

➢ Initiates alarms and emergency shut-down actions, performs monitoring of active protection systems and some automatic fire protection actions via the Safety Control System (SCS).

2. Firefighting Systems

➢ The firefighting systems include:
- o the fire water loop, with oscillating monitors,
- o the spraying systems,
- o Jetty water curtain,
- o The foam generators,
- o the dry chemical powder systems,
- o the Inergen systems for switchroom / substations
- o the fire fighting vehicles,
- o the portable/mobile fire extinguishers.

The detail of firefighting system are described in ***Appendix 8C***.

3. Communication system

A direct phone line shall be provided for communication with Authorities and emergency services (fire brigade, ambulance, etc.) in the case on emergency (hot line).

Additionally, hot lines shall be provided for direct communications between the Carrier, Central Control Room and Port Authority Control Centre.

There shall be a direct communication link with the Tsunami/Pacific Alert System to provide associated early warning of potential tsunami.

The communication system shall include means to warn people on site in the event of emergency:

- o Paging system with loudspeakers outdoors,
- o Flashing lights in areas with high noise levels in addition to the loudspeakers,

Direct communication links shall be foreseen as specified in the standard ISO 28460:2010 "Installation and equipment for liquefied natural gas - Ship-to-shore interface and port operations".

4. Safety Control System (SCS)

The alarms initiated by the detection systems perform some automatic fire protection actions via the SCS.

The SCS interface system gives also to the operator detailed information on areas involved in the hazardous event, type of hazard, concentration of gas, where in the area (if applicable), detector or loop involved, status of fire water pumps, status of protection systems, wind force and direction, temperature and relative humidity, system faults, reduced safety in the fire zones, etc.

5. Building Positive Pressure Ventilation

As a general rule, for all buildings the pressure inside building shall be kept positive during normal operation. Some rooms/areas which require a relatively negative pressure than the surrounding rooms/areas, indicated by a negative mark ("-"), are anyway at a positive pressure as compared to the outside pressure.

In case of gas vapour cloud, the HVAC (Heating, ventilation and air conditioning) system will be tripped and the louvers shall be closed in order to prevent the gas ingress.

The control rooms shall nevertheless be air refreshed by internal air circulation in case of HVAC tripping when gas cloud occurs.

8.5 IMPLEMENTATION ARRANGEMENTS

(1) Responsible Persons and Organization

Environmental management on emergency plan needs to be an integral element of environmental management and risk management of the operational phase. Therefore, the organization for environmental management proposed in the CEMP will also be responsible for environmental risk management.

However, the proposed measures for managing the operational risks will need to be implemented by project management team during the design and construction phase and by the LNG Terminal management team starting from the testing and commissioning through the operational phase.

The LNG Terminal management organization should have an emergency plan committee to be chaired by the manager and participated by the operational manager and the EHS manager. Other members of the safety management committee would be head of various units of sections of the LNG terminal. These unit heads will be responsible for the operation and maintenance of the units in strict adherence to the applicable work procedures. The risk committee will be involved in operational and environmental risks, including safety aspect. The risk committee will consistently review

and evaluate the operational risks of the LNG Facilities, and recommend necessary improvements of the work procedures to ensure the risks are minimized or avoided. ***Figure 8.5-1*** show the tentative organization chart of emergency responsible team for LNG Terminal Project.

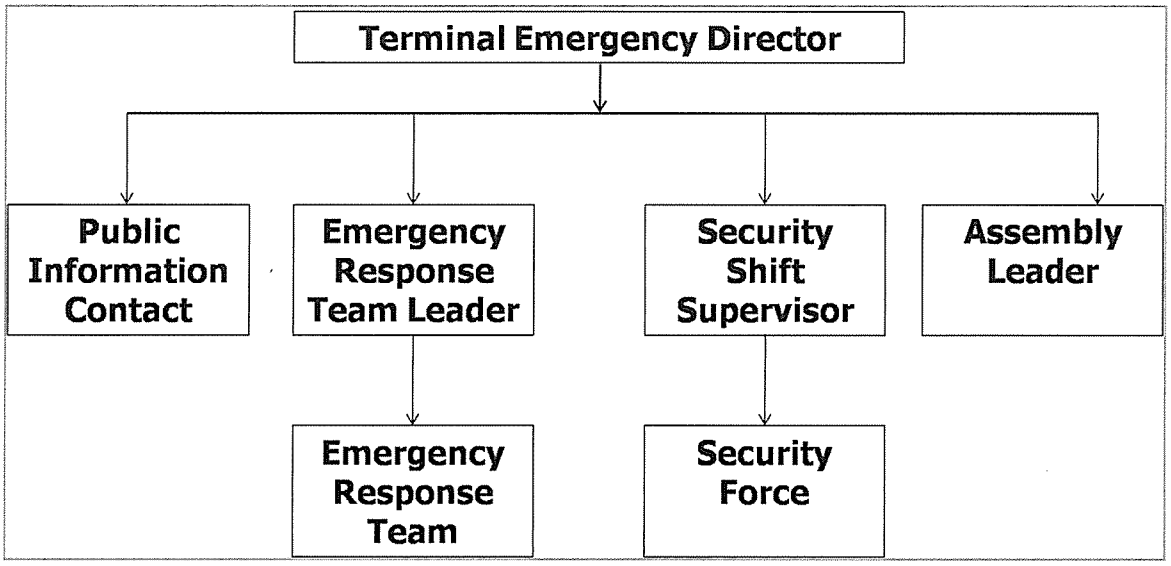


FIGURE 8.5-1 : THE TENTATIVE ORGANIZATION CHART OF EMERGENCY RESPONSIBLE TEAM FOR LNG TERMINAL PROJECT

(2) Risk Monitoring and Evaluation

For the operational risks, the following risk triggers should be considered for routine monitoring and evaluation:

- number of reported incidents of flooding/tsunami/cyclone, gas leakage, ship collision, fire accident and its trend;
- response time to address the reported flooding/tsunami/cyclone, leakage, ship collision, fire accident and its trend; and
- number of reported incidents of non-conformance with the work procedures and its trend.

CHAPTER 9

IMPLEMENTATION BUDGET AND SCHEDULE

CHAPTER 9

IMPLEMENTATION BUDGET AND SCHEDULE

9.1 BUDGET

9.1.1 Mitigation Measures

Construction Phase

All mitigation measures to be implemented in the construction will be included in the contract cost. As most mitigation measures are operational control measures, it is not possible to estimate their costs.

Operational Phase

All mitigation measures to be implemented in the operation will be included in the contract cost. As most mitigation measures are operational control measures, it is not possible to estimate their costs.

9.1.2 Monitoring

During the construction phase, a budget of about 627,220 USD (include 10% contingency) will be allocated for monitoring and evaluation of the Project's environmental and social performance over the construction period of 15 months.

During operation phase, budget for monitoring and evaluation will be allocated for 2 period separation. The first period will be for the first five-year plan after commissioning and another one for the 6th year throughout the project life (total operation period approx. 75 years). Therefore an annual budget of 574,750 USD equivalent (include 10% contingency) will be allocated for the five first year, and an annual budget of 5,065,500 USD (include 10% contingency) will be allocated from the 6th year throughout the project life. Therefore, total cost during operation phase approx. 5,640,250 USD (include 10% contingency). The cost detail and schedule are described in ***Appendix 9A***. In addition, the monitoring cost will be adjusted depended on situation and suitability of the project.

9.2 SCHEDULE

The schedule for implementing the Construction EMP (CEMP) and Operation EMP (OEMP) will be linked to the project schedule. After the Contractor completes the detailed designs and detailed construction plan and schedule, the Contractor should prepare a detailed CEMP within one month.

The Contractor should prepare a detailed OEMP within two weeks after commissioning of the LNG Terminal and its associated facilities.

APPENDIXES

APPENDIX 6A

SUB-PLANS FOR CEMP

APPENDIX 6A-1
GENERAL-CONSTRUCTION

APPENDIX 6A-1

GENERAL-CONSTRUCTION

Element	Content
Objective	• Manage construction in accordance with the Construction Environmental Management Plan (CEMP) and CEMP sub-plans to avoid or minimize adverse impacts on the environment and the community.
Performance Criteria	• Worksites prepared in accordance with designs providing for the management and mitigation of construction impacts. • Construction works (civil engineering and mechanical works) are managed to avoid, or mitigate and manage impacts on the amenity and environmental conditions prevailing in the vicinity of the worksites. • Non-compliance with guidelines and standards established in this CEMP are avoided or minimized. • Maintain safe and efficient access near worksites for emergency vehicles. • Take reasonable measures to minimize potential construction risks to construction workers, to the general public in adjacent areas and to the environment.
Mitigation Measures	**Hours of work:** • Works (civil engineering and mechanical works) which may generate excessive levels of noise, vibration, dust or traffic movements should only be undertaken between 6.30 am and 6.30 pm Monday to Saturday and at no time on Sundays or Public Holidays except for special circumstances where the works should be conducted outside these days and hours. • In case of urgent situation, exceeding the hours of work, information dissemination should be conducted prior to commence construction activities. • Special circumstances include works on transport of heavy and large process equipment to the construction sites, transport of materials for site filling, and transport of large construction equipment to the construction sites (on land and by shipment logistics). • Collection, loading and haulage of spoil from construction worksites by truck/ship would be undertaken between 6.30 am Mondays and 6.30 pm Saturdays. If this is taken place out of the hours of work and it is really or emergent to be done at that time, a request/information should be done prior to the action of collection, loading and haulage. • Notify local communities of duration and timing of works to be conducted outside of usual working hours. **Construction worksites:**

Element	Content
	• To be designed and constructed for the minimization, management and mitigation of construction impacts; • The main construction site will include foundation work, outer/inner tank, insulation work, roofing work, dredging work, placement of sand/rock material in the dredged area for breakwater construction, other infrastructures and routinely utilities/facilities, such as canteen with adequate space and facilities for eating and washing, decent worker accommodation, adequate number of hygienic toilets and baths, adequate clean piped water supply, drainage, wastewater disposal facilities, solid waste disposal facilities, material storage, equipment sheds, vehicle washing areas and project management offices. • LNG Tank: construct the inner tank first followed by modular construction of reinforced steel frames. Importantly, detailed and organized work management shall be prepared to enable parallel work. • Civil engineering and mechanical materials, for LNG Terminal, should be transported by shipment and lorry trucks appropriately in accordance with national regulations and acts. • Dredging work for navigation channel/turning circle/berthing area/seawall and breakwater and filling the reclamation area with sand/rock material and suitable fill material: shall be done during the hours of work (between 6.30 am and 6.30 pm Monday to Saturday). Also, turbidity will be measured and controlled, to ensure the least adverse impact on aquatic ecology. • To conduct spoil handling, storage and loading at all times within enclosures designed and constructed to achieve environmental objectives and performance criteria for noise and air quality as set out in the CEMP; • To have night lighting, including security lighting and avoid light spill onto adjoining premises, in excess of 8 lux measured at the common boundary; • To include fencing to worksite boundaries to ensure site security and public safety (onshore and offshore restricted area).
Monitoring	• Site inspections will be conducted as outlined in this CEMP.
Reporting	• Results of site inspections will be included in the environmental monitoring reports.
Area	• Onshore and offshore areas within the project site.
Responsible Agency	• Project developer and construction contractor.
Estimate Cost	• Include on pre-construction and construction cost

APPENDIX 6A-2

MANGROVE MANAGEMENT PLAN

Element	Content
Objective	• To reduce impacts on loss mangrove forest area from the Project. • To rehabilitate mangrove forest resources
Performance Indicator	• Types and number of flora species in disturbed mangrove forest area that clearance for proposed project site
Mitigation Measures	***Pre-construction*** and ***Construction Phases*** • Survey and record flora and fauna species in the Project site before land clearing. If endangered flora and fauna species are found, they should be moved to protected swamps and mangrove areas. • In case of conservation plant species will be found, the plant will be transferred to growth in green buffer zone, mangrove reforestation or other areas. • The mangrove rehabilitation program should also include mangrove reforestation to expand mangrove area which serves as natural sanctuaries for marine ecological resources. The proposed mangrove reforestation area in Chi Oo Klong is shown in ***Figure 1***. • After mangrove reforestation program is already accept by concerned authorities and local villagers, the Project must implemented follow the acceptable mangrove reforestation program. MONREC will support in this program include: -Inspection the implementation of the project must be follow acceptable mangrove reforestation program. -Cooperate with project developer during site survey in project land clearing site and the proposed mangrove reforestation area. • Mangrove rehabilitation program should be involve local villagers participates in site selection, prepare seeding, and maintain the areas. Developer should provide appropriate budget for this activity. • Green buffer zones should be created around the boundaries of the Project site. • Tree cutting will be avoided and cannot be done without prior permission from the Project Proponent's Project Manager. • Give a brief orientation for collectors/visitors (for educational and recreational purposes) about mangrove forest and other relevant topics for rehabilitation plan.
Monitoring	• Monitor flora and fauna species before project clearance

Element	Content
	- Frequency : 1 time before site clearance. • Monitor project site clearance to ensure that it is strictly carried out in accordance with proper equipment as specified in contract and ensure strictly conducted only within the project site - Frequency : 1 time/month during pre-construction/construction phase • Consider and monitor on mangrove rehabilitation area due to clearance activities for proposed project site - Frequency : 2 times/month during pre-construction/construction phase
Reporting	• Results of site inspections will be included in the environmental monitoring reports and submitted to MONREC and Port Authorities Department.
Area	• Mangrove rehabilitation area (investigating for the appropriate area).
Responsible Agency	• Project developer
Estimate Cost	• Approx. 6,000 USD Lumpsump for Flora and Fauna species investigate before land clearance

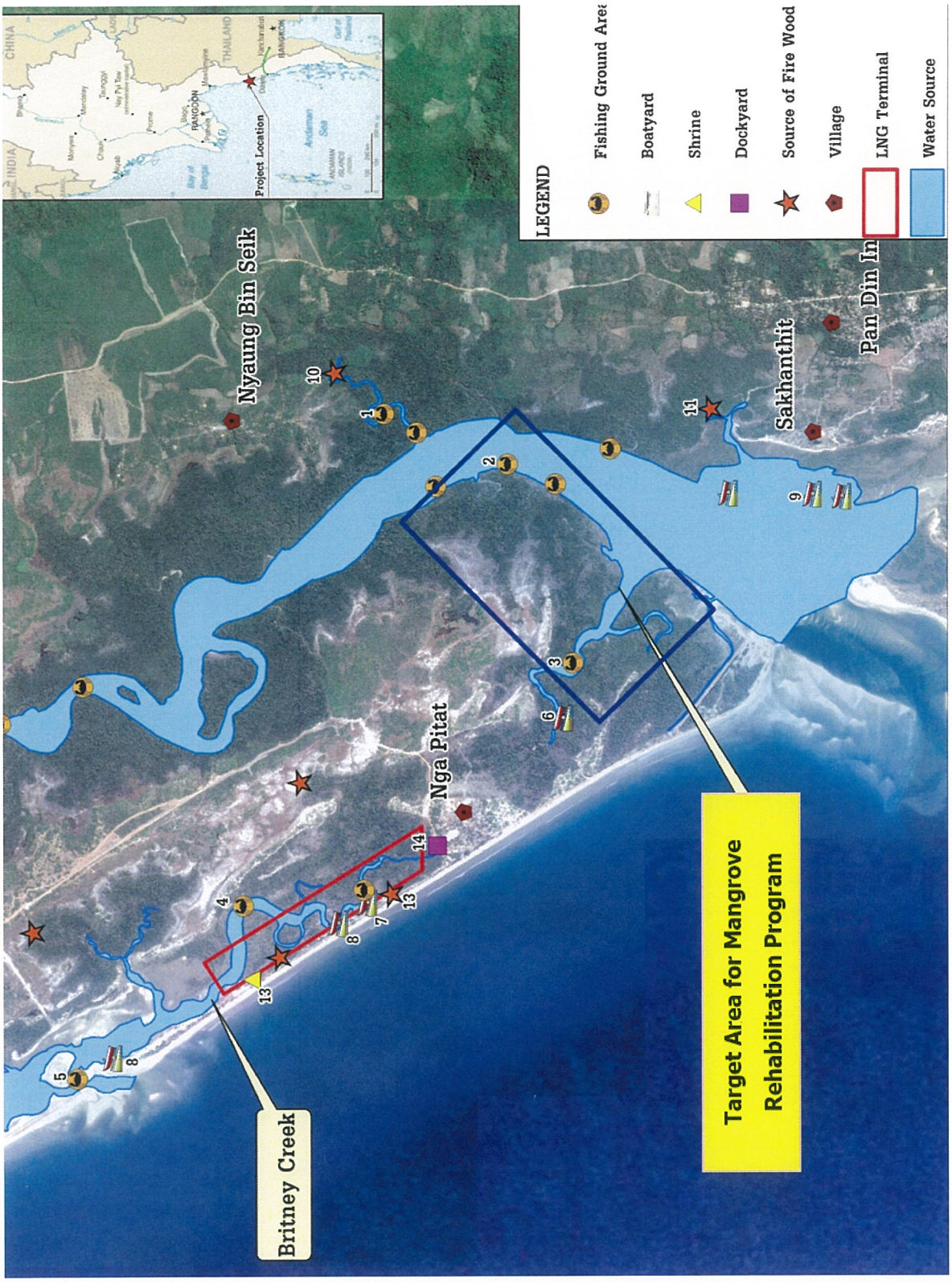


FIGURE 1 : PROPOSED MANGROVE REFORESTATION AREA AT CHI OO KLONG

APPENDIX 6A-3

AIR QUALITY MANAGEMENT PLAN

<table>
<tr><th>Element</th><th>Content</th></tr>
<tr><td>Objective</td><td>• Ambient air quality in the construction sites and at the identified sensitive receptors meets the prescribed standards throughout the construction period.
• Community concerns and complaints about air quality are addressed quickly and effectively.</td></tr>
<tr><td>Performance Indicators</td><td>• Number of complaints filed through the complaint response channel.
• Number of times that the local ambient air quality is below the prescribed standards related to dust and exhaust emissions.</td></tr>
<tr><td>Sources</td><td>The construction could adversely affect local air quality in and near the construction sites. The issues will be:
• Fugitive dust generated in soil compaction (site development work-removal of vegetation, top soil and engineered filling and compaction of raise the level of project area), and vehicle movements in the construction sites and along the transport routes;
• Exhaust emissions from ships, trucks and heavy construction equipment and materials powered by diesel engines and other kinds of fuel.</td></tr>
<tr><td>Applicable Standards</td><td>Applicable ambient air quality standards related to fugitive dust and exhaust emissions are as follows:
Table 1 – Construction Air Quality Goals
<table><tr><th>Pollutant</th><th>Not to be Exceeded</th></tr><tr><td>Particulate as PM_{10}</td><td>50 $\mu g/m^3$ (24 hr average)[1]</td></tr><tr><td></td><td>20 $\mu g/m^3$ (annual average)[1]</td></tr><tr><td>Total Solid Particulates (TSP)</td><td>230 $\mu g/m^3$ (24 hr average)[2]</td></tr></table>Remark: 1 = Ambient Air Quality Standards of World Bank (2007) / Myanmar Standard (2015)
2 = Ambient Air Quality Standards of World Bank Group (1998)</td></tr>
<tr><td>Mitigation Measures</td><td>The Contractor will conduct air quality surveys at the construction sites (non-mobile pollutant source) and trucks (mobile pollutant source) to identify sensitive receptors and update the baseline data established in the Final ESIA Report.
Pre-Construction Phase
Fugitive Dust Control
• Spray water at and around the construction areas and access roads during site preparation and grading.
• Enforce a speed limit for vehicles and trucks in the construction sites not to exceed 40 km/h. Construction activities shall be kept as planned so that the disturbed areas</td></tr>
</table>

Element	Content
	will be minimized at any time. • Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance. • Prohibit open burning of waste in the construction area. • Enforce speed limit for trucks not to exceed 40 km/h when passing the communities. • Cover construction materials with canvas or equivalent during transportation, materials should be dampened, if necessary, before transportation. • Establish a vehicle washing facilities to minimize the quantity of material deposition on public roads. • Establish a checkpoint at project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions. **Gaseous Emissions** • Adopt procedures to avoid vehicles from leaving the engines idle longer than 5 minutes if they have to queue to enter the construction site; • Maintain all equipment and vehicles in proper working conditions according to the manufacturer's specifications. The engines of construction equipment fleet must be routinely maintained by qualified mechanics to ensure their proper conditions during operations. • Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines). • Take measures to avoid congestion of trucks in areas near communities along the transport routes. A good traffic management plan will be required. ***Construction Phase*** **Fugitive Dust Control** • Mitigation measures for fugitive dust control during the pre-construction phase will also be applied to the control in the construction phase. **Gaseous Emissions** • Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites; • Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. • Provide adequate training to the equipment operators in the proper use of equipment. • Use the proper size of equipment for the job.

Element	Content
	• Use the equipment with engines that have latest low emission technologies (repowered engines, electric drive trains). For example, the diesel generator set to be used must be equipped with modern pollution control equipment. • Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines). • Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes. • Take measures to manage the movement of construction vehicles entering and leaving the construction sites to avoid, or mitigate and manage the potential for vehicle emissions impacting on adjacent properties. **Vessel** • Regularly maintain engines in good conditions. • Use low sulfur diesel fuel
Monitoring	***Pre-construction and Construction Phases*** **Ambient Air Quality** • Undertake local, 1 time per three months monitoring of ambient air quality in the vicinity of construction sites and Nga Pitat (closest sensitive receptors) for the duration of construction works, and in response to complaints, based on the following parameters: - Total suspended particulates (TSP) - Particulates (PM 10) • Monitor and manage the incidence of dust deposition and manage construction vehicle emissions in relation to ambient air quality. **Dust** • Monitor 1 time per three months or more frequently if weather conditions required, construction sites, stockpiles, vehicles and roads leaving the construction sites for evidence of dust generation or loose, unstable material with potential for dust. • Monitor regularly (weekly minimum) by inspection or other effective sampling: • The performance of dust filtration systems on construction shed ventilation systems; • Spillage or deposition of loose material on roads leaving a construction site. • Monitor performance of mitigation measures in relation to the construction air quality goals in the above table.

Element	Content
Reporting	• Twice a year. If more than one complaint is received in the preceding more frequently. • Twice a year reports for submission to MONREC and Port Authorities Department.
Area	• Project site. • Closest villages (Nga Pitat Village).
Responsible Agency	• Project developer. • Air quality monitoring agency • Construction contractor.
Estimate Cost	• 800 USD/station/time

APPENDIX 6A-4

NOISE MANAGEMENT PLAN

<table>
<tr><th>Element</th><th>Content</th></tr>
<tr><td>Objective</td><td>• To minimize noise level of construction activities.
• To ensure that the noise level at the identified sensitive receptors will not exceed the maximum limits prescribed by MONREC as a condition of the ECC and will be acceptable to the sensitive receptors.</td></tr>
<tr><td>Performance Indicators</td><td>• The incremental increases in noise level during the construction works compared to the targets.
• Net ambient noise level compared to the applicable ambient noise standards.</td></tr>
<tr><td>Sources</td><td>Noise (vehicles, trucks, cars, civil engineering and mechanical works and etc.) will be managed at the project site. The LNG Terminal construction site will be where construction activities causing noise will be most intensive and concentrated.
Construction activities creating noise at the project site are shown in the table below:
<table>
<tr><th>Construction Activities</th><th>LNG Terminal</th></tr>
<tr><td>Site Development</td><td>Removal of vegetation, top soil, engineered filling and site compaction.</td></tr>
<tr><td>Erection and installation of equipment (only noise) – civil and mechanical works</td><td>Materials and equipment and various kinds of vehicle will be generating disturbance noises in wide range within the project area</td></tr>
</table></td></tr>
<tr><td>Applicable Standards</td><td>Noise performance will be evaluated against the following standards:
National Ambient Noise Level Standards:
- Ambient noise level standard, Myanmar National Environment Quality (Emission) Guidelines, 2015.
Noise Standards: World Bank / IFC 2007
- Environmental, Health, and Safety (EHS) Guidelines, World Bank Group and International Finance Corporation, April 2007
Standard
Noise impacts should not exceed the levels presented in Table below, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.
<table>
<tr><th></th><th colspan="2">One Hour L_{Aeq} (dBA)</th></tr>
<tr><th>Receptor Daytime</th><th>Daytime
07:00 - 22:00</th><th>Nighttime
22:00 - 07:00</th></tr>
<tr><td>Residential; institutional; educational</td><td>55</td><td>45</td></tr>
<tr><td>Industrial; commercial</td><td>70</td><td>70</td></tr>
</table></td></tr>
</table>

Element	Content
	U.S. EPA Standard: Noise level not higher than 70 dB(A) $L_{eq\text{-}24\ hour}$
Mitigation Measures	**Design** • The Contract will require the Contractor and his sub-contractors to use construction equipment that generate low levels of noise and vibrations. The Contractor will present alternative construction equipment to demonstrate that the selected equipment adopts best available technologies to minimize noise level. • Before commencing the construction, the Contractor will conduct a noise and vibration survey covering the identified sensitive receptors to update the existing baseline data in the Final EIA Report. The noise survey will be manually conducted using a sound level meter following Noise Standard stated on Environmental, Health, and Safety Guidelines : Noise Management (April 30, 2007). • Demonstrate through predictive modelling of the proposed construction techniques and monitoring ambient noise and vibration readings prior to construction to establish pre-disturbance levels, the likely levels of noise due to construction works throughout the construction phase. ***Pre-Construction Phase*** • Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures. • Speeds of vehicles in the construction site will not be more than 40 km/hr. • Noise performance requirements of construction equipment will need to be clearly stated in contract specifications. • According to the existing condition of Noise Level at Nga Pitat Village, the results indicate that the noise level is higher than National Noise Level Quality Standard, National Environmental Quality (emission) Guidelines 2015 (Dry Season: 50.8-60.9 dB at day time and 50.5-60.5 dB at night time. Wet Season: 44.2-71.3 at day time and 50.5-60.5 dB 54.1-67.1 at night time). Therefore, the EPC contractor should be monitor before project construction to setting baseline data of noise levels. • The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the none compliance of noise performance.

Element	Content
	Construction Phase **Physical Measures** • Possibilities are limited for reduction of noise levels of construction equipment. The EPC contractor and the subcontractors may rent construction equipment from suppliers and would not be at liberty to improve them. It is difficult to design practicable noise retrofit kits to endure the environment of the construction sites. Therefore, the EPC contractor and his subcontractors should be required to use equipment that has best noise performance. • For piling, the EPC contractor should be required to use the piling method that has less noise compared to the percussive piling. If necessary, bored piling method should be considered. This method of piling consists of drilling a bore hole down to the required depth. Then a precast spun pile is inserted into the bore hole. Cement slurry is then poured into the bore hole to fix the inserted pile and provide friction. This method of piling generates noise during the soil boring. The noise emanates from the engine driving the boring machine. The noise level is generally lower than 75 dB(A) • During the period of other construction activities, net noise level at the site perimeter will have to be reduced by 15% to 20% if percussive piling is to be used, or by 11% to 16% if vibratory piling is to be used. • Provide ear plugs or ear muffs to workers operating in the excessive noise areas. **Management Measures** • Provide detail of construction activities to concerned authorities and local villagers. • The following management measures should be implemented to complement the physical measures. • Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures. • Speeds of vehicles in the construction site will not be more than 40 km/hr. • Noise performance requirements of construction equipment will need to be clearly stated in contract specifications. • The EPC contractor will be required to regularly monitor ambient noise levels at the receptors (e.g. Nga Pitat Village), particularly during the noise generation period such as piling and setting project facilities to checking the noise level at receptor should be within National Noise Level Quality Standard, National Environmental Quality (emission) Guidelines 2015, Myanmar (55 dB at day time and 45 dB at night time) or within existing data that measuring before

Element	Content
	construction phase. • If the noise level is exceeded than standard or existing data and received complain from local villagers, the project must be consider to setting temporary sound barrier to reduce impact from noise level to local village. • The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the noncompliance of noise performance.
Monitoring	• Undertake local, 1 time per three months monitoring of noise level in the vicinity of construction sites and Nga Pitat Village (closest sensitive receptor) for the duration of construction works, and in response to complaints, based on the following parameters: - L_{max}, - $L_{eq\ 1\ hr}$, - $L_{eq\ 24\ hr}$, - L_{dn} and, - L_{90} • Monitor and manage the incidence of noise level and manage construction vehicle noise level. • The Contractor is to implement measures to receive and respond to complaints about construction noise and vibration made at any time during the construction phase of the Project. Such measures may include a complaints management and correction action system developed and incorporated in this CEMP. Key requirements for the system include: - On receipt of a complaint, implement a complaint response procedure for tracking and responding to the issue(s) and the complaint; - Identify the relevant construction activity at which the complaint is directed; - As soon as practicable, investigate and measure the level of noise from that activity; - Respond to the complainant as soon as practicable upon completion of the investigation and describe the corrective action taken; and - Report to the Proponent on the complaint, the activity, the corrective action and the response.
Reporting	• Twice a year reporting on noise performance and complaints. • Twice a year reports for submission to MONREC and Port Authorities Department.
Area	• Project sites. • Closest villages (Nga Pitat Village).
Responsible Agency	• Project developer • Noise monitoring agency • Construction contractor.
Estimate Cost	• 700 USD / station/time

APPENDIX 6A-5

DREDGING AND DISPOSAL MANAGEMENT PLAN

Element	Content
Objective	To ensure that dredging activities do not create or minimize impact to both coastal water and marine ecology.
Performance Indicators	Qualities of the coastal water during dredging activities compared with the applicable coastal water quality standards.
Sources	• Dredged material (about 1.85 million cu.m.).
Applicable Standards	**Coastal Water Quality Standard:** • Marine water quality criteria for the ASEAN Region for aquatic life protection, 2008 - DO = >4 mg/L - Suspended solid = < 50 mg/L - Nitrate-Nitrogen = <60 µg/L
Mitigation Measures	**Design Concept** The Contractor will prepare detailed design of dredging and disposal activities. The proposed design concept is based on the principle dredging and disposal activities of as briefly described below: • **Vessel for Dredging Activities** • Disposal vessels should be equipped with accurate positioning systems, e.g. with AIS (Automatic Identification System), which shall be switched on during disposal operations. Disposal vessels and operations should be inspected regularly to ensure that the conditions of the disposal permit are being complied with, and that the crews are aware of their responsibilities under the permit. Ships' records and automatic monitoring and display devices (e.g. black-boxes), where these have been fitted, should be inspected to ensure that the disposal is taking place at the specified site. • The following typical methods are available to reduce plume generation when dredging with a TSHD (Trailer Hopper Suction Dredger): - Optimize trailing velocity, suction mouth and pump discharge rates. This results in less spillage from the drag head. - Limit overflow and/hopper filling. This is sometimes imposed on dredging operations but slows the dredging process, and increases costs significantly. - Reduce intake water. This results in more in-situ material being taken into the dredge. This increases costs as the fuel requirement per m^3 rises. The effect on the production rate is controlled by pumping at a higher rate. - Reduce air content in the overflow mixture.

Element	Content
	• The following typical methods are available to reduce plume generation when dredging with a CSD (Cutting Suction Dredger): - Optimize cutter speed, swing velocity and suction discharge. This reduces the spill rates at the cutter head, as more in situ material is taken up at the cutter head. This method will also optimize production rates and it should be the most cost effective method of dredging with a CSD. - Optimize cutter head design. This method requires a high level of detail of the soil characteristics to be removed. The method also optimizes production rates and it should be the most cost effective method of dredging with a CSD. • The following typical methods are available to reduce plume generation when dredging with a Backhoe dredge. - Use of a visor over the bucket. This is a relatively cost effective method, but does reduce production rates and thus increase overall Project costs. - Use of a silt screen. Silt screen scan under certain conditions can be used to minimize the impact of spilled dredge materials. They need to be moved carefully, and can considerably slow down production rates. If they are not used correctly, they are ineffective. • **Dredging** • Use techniques to minimize adverse impacts on aquatic life from the re-suspension of sediments; • Contractor must establish the baseline coastal water quality around the dredging and disposal area by conducting daily monitoring program at least 3 months prior to dredging activities. • The dredging activities must be stopped if total suspended solid exceeds 50 mg/L at any time. • Check and maintain sediment transfer pipe daily to ensure proper condition and prevent pipe damage cause of sediment spill into sea. • In case of damage on sediment pipe, the dredging activities must be stopped. • Prepare wave gauge, tide gauge, and anemometer to establish long term environmental information in this project area. • Check and maintain all machine and equipment to prevent oil leakage into sea. • Check and maintain TSHD and CSD to ensure that no sediment overflow into the sea. • Project Engineering should strictly control and prohibit contractor to dispose sediment from dredging activities into the sea and outside designated disposal area.

Element	Content
	• The monitoring results on coastal water quality must be sent to all concerned agencies. • Consider timing to dredge at most favorable points in the tidal cycle to minimize the turbidity plume. • Use silt curtain where practicable. • Consider timing of dredging to avoid sensitive periods for marine animals. • **Disposal** • Avoid off shore disposal activities to prevent impact on coastal water quality and marine ecology. • Use the dredged materials for on-land disposal within the Early Industrial to the maximum extent. • **Marine Ecology** • Apply the same mitigation measures as recommended for coastal water quality and wastewater. • Provide information on the construction schedule and construction area to local fishermen living near the port such as Pan Din In, Sakhanthit, Muangmagan and Nga Pitat villages. • Coordinate with local authorities to protect coral and other marine resources.
Monitoring	• Once a month collection of 10 sampling stations of coastal water and marine ecology at location around access channel especially during dredging activities • Once a month collection of 10 sampling stations (same as for coastal water). The Parameter includes Plankton, Benthos, fishery and marine protected species
Reporting	• The results of monitoring will be presented in the monitoring reports. • Twice a year reporting on dredging and disposal management, and submit to MONREC and Port Authorities Department.
Area	• Dredging Area include Approach channel, Turning Cycle • Surrounding of dredging area (Andaman Sea)
Responsible Agency	• Project developer • Contractor • Sub-contractors
Estimate Cost	• 500 USD /station/time for coastal water quality measurement • 1,000 USD/station/time for marine ecology and protected species.

APPENDIX 6A-6

WASTE MANAGEMENT PLAN

Element	Content
Objective	To minimize all types of wastes generated at the construction sites, particularly the construction site, that will have to be disposed. To minimize environmental impacts of waste disposal.
Performance Indicators	Number of complaints related to waste disposal.
Sources	Wastes will be divided into three categories: • Construction, demolition, and land-clearing (CDL) waste: Includes all non-hazardous solid wastes resulting from site clearing, excavation, concrete works, steel works, piping works, installation of equipment, and construction of buildings. CDL wastes for this Project will consist of vegetation removed from the site before site preparation works, excavated materials particularly top soil, construction debris, remnants of steel bars and beams, packaging materials, broken roofing materials and tiles, and remnants of pipes, glasses, and other inert building materials. • Non-construction waste: Includes wastes generated in worker camps, canteens and offices such as paper, food and beverage containers, food wastes, and other domestic items.
Applicable Standards	Applicable guidelines and standards regarding the management and disposal of the three categories of wastes as prescribed by MONREC or enforced by the local government, whichever are more stringent.
Mitigation Measures	**Design and Planning before Commencing the Construction** • The Contractor will consult with the EHS Manager of the Project Proponent, ECD, SWB and the township governments the possibility of using existing waste disposal facilities managed by the regional or local governments. If this not possible, the Contractor will need to develop its own disposal facility preferably within the construction site, if possible. • The Contractor will ensure that the design and the proposed construction methods will generate the least amount of wastes. • Based on the construction plan, methods, and schedule, The Contractor will prepare estimates of the quantity of each waste category to be generated in each quarter of the construction period. The estimates will be monthly updated. • The Contractor will propose methods for waste reuse and recycling and prepare estimates of the remaining quantity of each waste category that will be disposed off. • The Contractor will propose methods of waste transport and disposal.

Element	Content
	• The Contractor will then prepare an action plan for waste management for the first quarter of the construction period containing all the above estimates and proposals. The action plan will be submitted to the EHS Manager of the Project Proponent not later than three weeks before commencing the construction. • The subsequent quarterly action plans will be prepared by updating or revising the preceding plans as appropriate to reflect cumulative results of the previous quarters. The next quarterly action plan will be submitted to the EHS Manager not later than two weeks before the end of the current quarter. • Consider using materials and products that have a recycled content wherever cost/performance competitive, and where environmentally preferable to the non-recycled alternative; • Arrangements with suppliers to return any unused construction materials; • Where possible, goods to be ordered in bulk to minimize packaging waste and packaging material returned to the supplier wherever practicable ***During Pre-Construction*** **Site Clearing Waste** • Arrangements should be made to enable local villagers to harvest woods for timber or charcoal making before the site clearing operation. Alternatively, the vegetation wastes should be separated into usable timber and woods, and small boughs, twigs, and leaves that will need to be disposed. The separated timbers and woods could be sold or given to villagers. The unusable wastes will be disposed of in a landfill site to be selected by the contractor with approval of the concerned authority. • Alternatively, chipping and mulching of unusable vegetation wastes should be carried out. The mulched materials could be later used for landscaping purposes. • Open burning will not be permitted. ***During Construction*** **(1) Waste Reduction at Sources** **Waste Segregation** • The Contractor will design and implement a waste segregation system and procedure and communicate it to all construction personnel to strictly adhere to the segregation procedure; • An appropriate number of containers with adequate volume and appropriate materials will be provided at strategic locations to support the segregation. Each waste category will be segregated into recycling, reuse and disposal sub-categories.

Element	Content
	Waste Collection and Storage • Daily collection and transport will be organized and carried out for each sub-category of segregated wastes; • A roofed storage area with adequate space will be provided for storing the segregated wastes waiting for the on-site or off-site reuse or recycling; • The storage area for hazardous waste will need to be specially designed to prevent spills or leaks onto the soil. **Waste Reuse and Recycling** • Reuse of excavated material as fill at approved fill sites; • Collection and return of packaging materials (e.g. pallets) to suppliers wherever practicable; • Use of recycled materials to the limits of design in concrete, road base, asphalt and other construction materials; • Remove any contamination inadvertently deposited in recyclable waste material containers. Provide cleanup of excessive contamination at recycling vendor locations when such contamination is not controlled at the project site; - Collection and recycling of used oils by a licensed contractor; - Collection by a licensed contractor of empty oil and fuel drums and other containers for return to recycling facilities. **(2) Waste Disposal** **General Requirements** • An efficient construction waste management system should be established and implemented. Construction waste will need to be classified and sorted out at source for disposal. The disposal methods will depend on the types of wastes: direct reuse in the construction, sale and recycling of materials, land filling for inert materials and specific treatment method for each type of hazardous materials. • Haphazard disposal of construction waste in or off the construction site will be prohibited. • No burning of wastes will be allowed. **Construction and Land Clearing Wastes** • Construction wastes should be handled by the existing municipal solid waste collection and disposal services. If such service is not possible, the construction wastes would need to be disposed off in the Project site. They may be buried in areas designated for green areas. **Non-construction Wastes** • Non-construction wastes will be disposed off with the construction wastes. • Provide adequate number of refuse bins or containers with tight covers, daily collection of disposal.

Element	Content
	(3) On-site Record Keeping The Contractor will design and maintain record keeping procedures with provisions for: • Tracking collections of waste materials at the sites and deliveries to recycling, reuse, salvage, and landfill facilities. • Maintaining on-site logs that include for each load of materials removed from the site: type of material, load weight, recycling/hauling service, and date accepted by recycling service or landfill. • Accessibility to the EHS Manager of the Project Proponent for verification of construction waste recycling. Legible copies of on-site logs, manifests, weight tickets, and receipts. Manifests shall be from recycling and disposal site operators that can legally accept the materials for the purpose of recycling, reuse, salvage, or disposal.
Monitoring	Monitoring of the waste management performance will be carried out through quick daily site inspections and detailed weekly site inspections. Daily site inspections will include observation of the collection and storage of waste materials in the construction sites and waste disposal areas, and reviewing the daily records. This will be focused on efficiency of the collection, storage, and disposal; and on the quality of the records. The EHS Managers of the Project Proponent and the Contractor will jointly inspect the sites. In weekly site inspections, the EHS Manager will be participated by the Resident Engineer of the Project Proponent and the Construction Manager of the Contractor. The inspection will cover verification of the records, disposal activities, discussion on the performance of the past week, and identification of problems, if any, that affect the waste management performance.
Reporting	• Report immediately to the relevant authorities any incident where harmful waste material is accidentally released to the environment. • In the event of an environmental incident, take such corrective or remedial action as is required to render the area safe and avoid or minimize environmental harm. • Monthly reports on the waste management results as part of the monthly monitoring reports. • Twice a year reports for submission to MONREC and Port Authority Department.
Area	• Project sites.
Responsible Agency	• Project developer • Construction workers • Sub-contractors (waste management company)
Estimate Cost	• include on cost for pre-construction and construction

APPENDIX 6A-7

WASTEWATER MANAGEMENT PLAN

Element	Content
Objective	To ensure that all wastewaters generated during the construction will be adequately treated before discharging into the sea
Performance Indicators	Qualities of the treated effluent compared with the applicable effluent quality standards.
Sources	• Domestic wastewater generated by living activities of about 300 persons at peak of construction, estimated volume about 45 m^3/d. • Construction wastewater, estimated volume about 42 m^3/d. • Surface runoff (approx. 104,050 m^3.)
Applicable Standards	**Effluent quality standards:** • General Guideline of Site Runoff and Wastewater Discharges (construction phase), National Environmental Quality (Emission) Guidelines, 2015 • Environmental, Health, and Safety-General Guidelines Environmental Wastewater and Ambient Water Quality, April 30, 2007 (World Bank Group/IFC); Standard (both from Myanmar and World Bank Group/IFC Guidelines) - Oil and Grease = 10 mg/L - pH = 6-9 - Total Suspended Solid = 50 mg/L - BOD = 30 mg/L - Total Nitrogen = 10 mg/L
Mitigation Measures	**Design Concept** The Contractor will prepare detailed design of a wastewater management system for the LNG Terminal construction site. The wastewater management system will consist of a collection system and a simple treatment system. The proposed design concept is based on the principle of wastewater segregation, treatment and reuse as briefly described below: **Waste Water Reduction at Sources** Domestic sewage and wash water will be appropriately treated and reused on site as much as possible to minimize the volume to be discharged into the sea. Wash waters will be treated to remove suspended solids and neutralize, if necessary. The treated effluent will be reused on site as much as possible to minimize the volume to be discharged into the sea. Storm water cannot be reduced and will need to be drained inside the construction site. Therefore, drainage system with retention pond will be proposed to collect storm water and remove suspended solid before discharged into the sea or nearby discharge channel.

Element	Content
	Treatment and Disposal The EPC Contractor will be required to prepare detailed design of a wastewater management system for the LNG Terminal construction site. The wastewater management system will consist of a collection system and a simple treatment system. The proposed design concept is based on the principle of wastewater segregation, treatment and reuse as briefly described below: **Surface Runoff** • The site preparation activities, including land clearing and site filling and compaction, should be carried out during the dry season to avoid the problem of surface runoff with high turbidity discharging into the open sea or nearby drainage channels, if exist. • Storm water cannot be reduced and will need to be drained inside the construction site. Therefore, drainage system with retention pond will be proposed to collect storm water and remove suspended solid before discharged into the sea or nearby discharge channel. • The collected storm water will be drained into a retention pond for removal of suspended solids before discharging into the sea or a nearby drainage channel, if exist. After the construction, the retention pond will be retained and used for wastewater management during the operational phase. **Domestic Wastewater** • Toilet wastes will be separated from grey water or salvage. • Kitchen and canteen waste water will be discharged into oil and grease trap tank before draining into a retention pond. • Toilet wastes will be discharged into a septic tank (or more than one septic tank) with a hydraulic retention time of about 5 days. The volume of toilet wastes is estimated at about 20% of the total volume of domestic wastewater, or about 3 m^3/d. The septic tank effluent (seepage) will be discharged into the retention pond. Alternatively, toilet wastes and grey water could be treated in a package sewage treatment plant. • Grey water will be discharged into the retention pond. • The retention pond will be designed as an oxidation pond with a hydraulic retention time of about 7 days.

Element	Content
	Wash Waters • The concrete wash water and the wheel wash water will be discharged into a concrete settling basin. The effluent will be treated to adjust the pH, if necessary, and reused. The remaining effluent will be discharged into the retention pond. • Water in the retention pond will be used for dust suppression on unpaved areas in the construction site, watering of the green area, concrete washing, and wheel washing.
Monitoring	• Once a month collection of one water samples at Effluent from release point of temporary drainage system. The treatment performance of the drainage system will be assessed from the monitoring data.
Reporting	• The results of monitoring will be presented in the monitoring reports. • Twice a year reporting on wastewater performance, and submit to MONREC and Port Authorities Department.
Area	• Project sites. • Effluent Discharge Point
Responsible Agency	• Project developer • Construction workers • Sub-contractors (wastewater management company)
Estimate Cost	• 600 USD/station/time

APPENDIX 6A-8

HAZARDOUS WASTE MANAGEMENT PLAN

Element	Content
Objective	To minimize all types of hazardous wastes generated at the construction sites, particularly the LNG Terminal construction site, that will have to be disposed. To minimize environmental impacts of waste disposal.
Performance Indicators	Number of complaints related to hazardous waste disposal.
Sources	Hazardous waste: Includes such wastes as spent lubricating oil, paints, and chemicals used in the construction. Most of the hazardous wastes are in liquid form.
Applicable Standards	Applicable guidelines and standards regarding the management and disposal of the three categories of hazardous wastes as prescribed by MONREC or enforced by the local government, whichever are more stringent.
Mitigation Measures	• Hazardous wastes will be handled by a licensed hazardous waste contractor. If this service is not available, the Contractor will need to find appropriate arrangements for incineration, safe permanent storage, or other appropriate methods of disposal. • A Hazardous Waste Management System covering waste classification, separation, collection, storage, transfer and disposal should be set up and operated. The waste management system will comply with applicable regulation of the government, if any.
Monitoring	Monitoring of the hazardous waste management performance will be carried out through quick daily site inspections and detailed weekly site inspections. Daily site inspections will include observation of the collection and storage of hazardous waste materials in the construction sites and hazardous waste disposal areas, and reviewing the daily records. This will be focused on efficiency of the collection, storage, and disposal; and on the quality of the records. The EHS Managers of the Project Proponent and the Contractor will jointly inspect the sites. In weekly site inspections, the EHS Manager will be participated by the Resident Engineer of the Project Proponent and the Construction Manager of the Contractor. The inspection will cover verification of the records, disposal activities, discussion on the performance of the past week, and identification of problems, if any, that affect the waste management performance.

Element	Content
Reporting	• Report immediately to the relevant authorities any incident where harmful waste material is accidentally released to the environment. • In the event of an environmental incident, take such corrective or remedial action as is required to render the area safe and avoid or minimize environmental harm. • Monthly reports on the waste management results as part of the monthly monitoring reports. • Twice a year reports for submission to MONREC and Port Authorities Department.
Area	• Project sites.
Responsible Agency	• Project developer • Construction workers • Contractor/Sub-contractors (waste management company)
Estimate Cost	• include on cost for pre-construction and construction

APPENDIX 6A-9

NAVIGATION MANAGEMENT PLAN

Element	Content
Objective	• To minimize potential impacts from navigation activities to the local fishermen during pre-construction/construction phases
Performance indicators	• Number of navigation accident in the identified impact areas • Number of vessels during the construction period.
Sources	• Navigation disturbances could be caused by haulage of construction materials, equipment, and dredging activities. • Potential impact areas: - Approach Channel of LNG Terminal ; and - Andaman Sea (Navigation Route to LNG Terminal)
Management guidelines	• Take reasonable and practicable measures to avoid, or mitigate and manage the potential navigation impacts on navigation route of local fishermen near the worksites. • Minimize as far as reasonably practicable, potential navigation disruptions to the operation of the navigation route due to the transport of materials to and dredging activities.
Mitigation Measures	**Design Concept** **1) Vessel Traffic Management** A comprehensive Vessel Traffic System and Management Information System (VTS MIS) will be required for this port. This will include: • computing hardware • communications (voice and data) equipment • surveillance technology • technical support infrastructure such as power, environmental • conditioning, security, and Human Machine Interfaces (HMI) • the VTS MIS systems functionality, including command and control • capability, COP generation and management, integrated sensor control, • disaster recovery, and record and replay, both for training purposes and • legislated incident analysis and reporting requirements All elements of port and landside logistics, security, and traffic management will be provided for through: • detailing location and functionality of a central control room/tower • sensor implementation, inclusive of radar, AIS, CCTV,

Element	Content
	telephone, radios, AIS AtoN's, and MetOcean equipment • multi-sensor fusion VTS system to provide the Common Operating Picture • Port Management Information System for logistics/scheduling and implementation and management of charging mechanisms • associated IT infrastructure • Integration as necessary with other tools such as Portable Pilotage Units, Laser Docking Systems, Mooring Management Systems, Quick Release Hooks, etc. **2) Sea Traffic** • Install signs and warning signs that can be clearly seen (200 m from the construction area) to show the boundaries of offshore construction areas. • All vessels operating in nighttime must receive special permits. • All concerned safety rules have to follow the laws related to transportation section of Myanmar. • Provide information on the boundaries of offshore construction areas and working schedule to all fishing boat operators. • Train all concerned crew on navigation safety in the offshore construction areas. • Carry out routine check and maintenance of vessels to follow safety instructions. • Prepare and maintain readiness for implementing an emergency plan related to marine accidents.
Monitoring	• Monitor number of vessel and boat two times during construction phase at proposed dredging area and River mouth of Britney Creek. • Monitor navigation accident situation related to the project every day at Access Channel of LNG Terminal.
Reporting	• Monthly report on navigation conditions, including any accidents. • Twice a year reporting on navigation performance, and submission to MONREC and Port Authorities Department.
Area	• Project sites (especially at proposed dredging area) • River mouth of Britney Creek
Responsible Agency	• Project developer • Sub-contractors
Estimate Cost	• 500 USD/station/time for monitoring number of vessel and boat at dredging area and River mouth of Britney Creek throughout pre-construction and construction phase • Cost for monitoring navigation accident situation related to the project include on cost for pre-construction and construction

APPENDIX 6A-10

TRAFFIC MANAGEMENT PLAN

Element	Content
Objective	• Manage construction traffic and transport issues to minimize potential impacts on the communities and the operation of the road network
Performance indicators	• Number of traffic accidents in the identified impact areas • Number of traffic on Road during the construction period.
Sources	• Traffic disturbances could be caused by haulage of spoil, fill materials, construction materials and plant equipment. • Potential impact areas: - ITD Coastal Road; - Nga Pitat Road
Management guidelines	• Take reasonable and practicable measures to avoid, or mitigate and manage the potential construction traffic impacts on communities near the worksites. • Minimize as far as reasonably practicable, potential traffic disruptions to the operation of the road network and the public transport network due to the transport of materials to and from the construction sites. • Maintain safe access near all project work areas for road users, including pedestrians and cyclists. In particular, develop local access strategies in consultation with stakeholder groups to maintain safe, convenient and efficient access to community facilities such as schools and monastery, if any. • Implement traffic management measures near worksites and other project works to avoid conflicts between construction traffic, and pedestrians and cyclists. • Take reasonable and practicable measures to inform the local and broader communities about the timing and scale of changes to traffic conditions on roads in the vicinity of worksites and construction works. • Monitor traffic flows near construction works and take corrective action in response to traffic impacts as a consequence of construction works.
Mitigation Measures	***Pre-construction Phase*** • Consultation with the concerned authorities at the national, regional, and township levels on develop and implement a Construction Traffic Management Plan. • Measures to manage the operation of the construction truck fleet for incorporation into a Construction Vehicle management sub-plan. • Post warning signs along the right of way where the access road construction takes place. • Implement management measures to avoid, or minimize increase in traffic caused by the project works in local streets as practicable; • Notify the local community about proposed changes to local traffic

Element	Content
	access arising from construction activities, and provide clear signage of changed traffic conditions and take other measures to ensure safe traffic movement; • Employ local people a Nga Pitat village to give a sign when local villagers walk across the road during pre-construction • Prepare and implement an employee parking policy for the construction work sites to manage the impacts on car parking in the vicinity of worksites and help avoid project parking in local streets ***Construction Phase*** **Truck routes and construction site access** • In consultation with the concerned authorities at the regional, and township levels, develop and implement a Construction Traffic Management Plan to address the following issues: - Avoid haulage tasks during peak traffic periods as far as practicable. Where haulage in peak periods is unavoidable, such activities are to be managed in accordance with specific traffic management sub-plans provided to the relevant agencies in advance. - Control heavy vehicle movements on project related road to avoid interference with major events, if any; - Investigate the capacity of intersections on haulage routes to minimize impact on intersection operations by heavy vehicles servicing the construction worksites; - Prepare and implement a comprehensive construction traffic management plan to control truck movements to avoid, or mitigate and manage the impacts of heavy vehicle traffic on the road network. • Measures to manage the operation of the construction truck fleet for incorporation into a Construction Vehicle management sub-plan to include: - Monitoring of truck position, speed, route and performance in relation of traffic conditions and schedule requirements; - Management of truck speed and position to avoid queuing on the approaches to the spoil handling and loading facilities; - Management of traffic signals on nominated spoil haulage along the routes; - Maintain all vehicles transporting material to and from the construction sites to a high standard (ADR28/01) with regards noise emissions, exhaust emissions, traffic safety and operational safety; - Ensure all vehicles leaving a construction site pass over or through devices designed and maintained to remove soil and other materials. **Construction Traffic Hazards** • Heavy trailer trucks transporting heavy and large plant equipment will have to be directed by a traffic police car.

Element	Content
	Local Traffic • Implement management measures to avoid, or minimize increase in traffic caused by the project works in local streets as practicable; • Notify the local community about proposed changes to local traffic access arising from construction activities, and provide clear signage of changed traffic conditions and take other measures to ensure safe traffic movement; • Prepare and implement an employee parking policy for the construction worksites. • Employ local people a Nga Pitat village to give a sign when local villagers walk across the road during construction **Traffic Management at the Intersection of ITD Coastal Road and Nga Pitat Road** • Provide a traffic police or relevant officer to control traffic at the intersection during the transport period. **Pedestrians and Cyclists** • Maintain safe pedestrian and cycle access near construction works (particularly for elderly and children), including to community facilities, such as schools, monastery, open space and particularly: • Notify the local community, and in particular, local schools, about changes to pedestrian and cycle access during construction near construction works; • Provide traffic controls designed for the safe movement of cyclists near the worksites.
Monitoring	• Monitor number of vehicles two times during construction phase at Nga Pitat Village. • Monitor traffic accident situation related to the project every day at project access road.
Reporting	• Monthly report on local traffic conditions, including any accidents involving construction traffic. • Twice a year reporting on traffic performance, and submission to MONREC and Port Authorities Department.
Area	• Local roads (at Nga Pitat Village)
Responsible Agency	• Project developer • Sub-Contractor
Estimate Cost	• 500 USD/station/time for monitoring number of vehicles throughout pre-construction and construction phase • Cost for monitoring vehicles accident situation related to the project include on cost for pre-construction and construction

APPENDIX 6A-11
OHS MANAGEMENT PLAN

Element	Content
Objective	To establish best practicable OHS conditions to ensure work related health and safety of construction personnel.
Performance Indicators	• Total Recordable Injury Frequency Rate (TRIFR) • Lost Time Injury Frequency Rate (LTIFR) • Medical Treatment Injury Frequency Rate (MTIFR) • Duration rate • Incident rate
Sources	Public safety related to construction traffic will be managed in the traffic management plan. The issues of concern in this OHS plan are worker safety in construction site.
Applicable Standards	OHS guidelines and standards enforced by the Ministry of Health and proposed for this Project as follows: "To safeguard public health and to take necessary measure and respect of environmental health"
Mitigation Measures	**Design and Planning before Commencing the Construction** • The Contractor will prepare an OHS management plan and implementation procedures specific to this Project and in line with its corporate OHS policy and procedures. The OHS management plan and implementation procedures will be submitted not later than one month before commencing the construction for approval of the Project Manager of the Project Proponent and relevant authorities, if so required. • The Contractor will conduct necessary orientation and training to all construction personnel to ensure that the construction personnel clearly understand the OHS plan and implementation procedures. • The OHS management plan and implementation procedures will cover but not limited to the following subjects: - Organization and responsibilities of OHS management - Training plan - Communication plan - Contractor responsibilities - Job-specific work requirements - Compliance monitoring and evaluation plan - Audit plan - Reporting system - Documentation system • Develop and implement safety measures for the construction works including treatment strategies that address fire and chemical hazard, communications, access for emergency services, response coordination and

Element	Content
	management. • Develop emergency response procedures, and implement in the event of accidents and emergencies. • Provide fire and life safety measures, including ventilation, smoke extraction and firefighting systems for the duration of the construction phase. **During Pre-construction** The contractor for the site clearing works will need to take appropriate protective measures to minimize workers' exposure to fugitive dust, excessive noise, and gaseous emissions and to reduce the levels of dust, noise and gaseous emissions at the construction site. The workers will have to be adequately briefed on safety aspects of the site clearing works. **During Construction** • The implementation of the OHS plan will be integrated with construction supervision. • The Contractor will implement the OHS plan and procedures as part of its construction supervision. The Contractor's site engineers and foremen will supervise the implementation of OHS procedures to comply with relevant requirements. • The Contractor's EHS Manager will monitor the OHS performance. • Establish first-aid service at the construction site. • Make necessary arrangements for providing medical services to construction personnel. **Health Risks** • All recruited workers should receive health examinations for screening of major communicable diseases before employment. Subsequently, annual check-ups should be provided. • Symptoms of major communicable diseases, if noted, should be immediately reported to the district medical officer for proper treatment. • Provide health awareness training to workers on hygiene and sanitation, communicable and infectious diseases. **Security Risks** • All workers should be cleared with the local security authorities regarding criminal records before employment. • The EPC contractor will be required to establish and implement a site security system and appropriate measures, including prevention of drug abuse.

Element	Content
Monitoring	• Monitoring of OHS performance of the Contractor will be made through: - Daily informal inspections (walk through of the construction sites) - Weekly formal inspections of the work place. - Audits - Corrective Action Reports • The daily inspections will observe: (i) adherence of the construction workers to the OHS procedures such as wearing of protective equipment in high risk working areas; (ii) working conditions; (iii) readiness of fire and life safety systems as relevant; and (iv) potential new hazards. The daily inspections will be carried out by the Contractor's EHS Manager and Construction Manager, Site Managers, and relevant foremen. The Project EHS Manager will occasionally join the daily inspections. The Contractor's EHS Manager will prepare daily OHS inspection notes as part of the site inspection notes. • The weekly formal inspections will be carried out at weekly intervals and shall be documented using appropriate "Weekly OHS Inspection Checklists". The Contractor's Construction Manager, EHS Manager, and Site Engineers will carry out the weekly inspections. The Owner's EHS Manager will jointly undertake the weekly inspections. Subcontractors will also be required to participate in the weekly inspections. The weekly inspections will include plant, substances, equipment and temporary structures used by subcontractors. • Internal audits will be carried out annually or more frequent if the OHS performance is significantly below established targets. The internal auditor or team will be engaged by the Contractor with concurrence of the Project Proponent. • Monitoring results will be discussed in Project OHS monthly review meetings.
Reporting	• Monthly as part of the monthly monitoring reports except in case of an incident when reporting should occur immediately on completion of any investigation required to resolve the incident. • Twice a year reporting on OHS performance, and submission to MONREC and Port Authorities.
Area	• Project sites.
Responsible Agency	• Project developer • Construction workers • Sub-contractors (waste management)
Estimate Cost	• include on cost for pre-construction and construction

APPENDIX 6A-12

RESOURCE USED MANAGEMENT PLAN

Element	Content
Objective	To ensure that Nga Pitat villagers can still utilize marine and coastal resources sufficient to their livelihoods.
Performance Indicators	Number of complaints related to resource management.
Sources	Loss of fishing ground and boatyard areas in Britney Creek cause of livelihood affect to Nga Pitat Villagers
Applicable Standards	All complaints about construction about 15 months period
Mitigation Measures	**Pre-Construction** • The Project Proponent intends to develop Chi Oo Klong area inside Pan Din In River to provide the new ground for fishing and resource harvesting and the new area for fishing boats berthing. • The Project Proponent will need to prepare a detailed plan for the development of this alternative area in consultation with the affected local villagers and fishermen, and concerned authorities including MONREC, the Fisheries Department at Taninthayi Region, and the Port Department. The development will need approval from these authorities. If justified, supports will be provided to the affected local villagers and fishermen to enable them to adjust to the new fishing ground and boatyard area. • In addition, the Project Proponent should design and implement a livelihood restoration program (LRP) for the affected people in consultation with them and the concerned authorities. - Community forest and mangroves management - Coastal aquaculture within extensive system - Fish processing - Crop cultivation techniques - Product development and marketing - Food preparation and preservation • The affected people should be given preferential treatment in employment in the Project. **During Construction** • Continue the implementation of livelihood restoration measures proposed in the pre-construction phase. • Continue through provision of knowledge for strengthening occupation career as proposed during pre-construction phase • Conduct attitude survey to collect information on local concerns, issues, and problems of the communities in the new alternative fishing ground and boatyard area (should be all household in Nga Pitat Village)

Element	Content
Monitoring	• Report community consultation's activities and on consultation. • Attitude survey to collect information on local concerns, issues, and problems of the communities in the new alternative fishing ground and boatyard area (should be all household in Nga Pitat Village) at least 1 times per three month.
Reporting	• Results of the resource management will be included in the monthly monitoring reports and the twice a year reports for submission to MONREC and Port Authorities. • Report immediately to the relevant authorities in case of complaint from villagers.
Area	• Proposed new fishing ground and boatyard area (Chi Oo Klong) • Project sites/fishing ground/villages/natural resources within the area nearby project site.
Responsible Agency	• Project developer
Estimate Cost	• 300,000 USD lump sump throughout pre-construction / construction phase

APPENDIX 6A-13

SOCIAL ENVIRONMENTAL MANAGEMENT PLAN

Element	Content
Objective	Avoid or mitigate and manage construction impacts on the social environment. *Note: The social environment includes residential and neighborhood amenity, connectivity, community health, community diversity, social infrastructure provision, livelihood and safety.*
Performance Indicators	Number of grievances or complaints filed with the Project Management Office of the Project Proponent Number of complaints successfully responded
Sources	Daily living of people in the surrounding communities may be disturbed or inconvenienced by environmental disturbances caused by the construction such as dust, traffic inconveniences (both land traffic and navigation), noise, coastal water, and workers' misconduct. The management of social environment will cover 3 villages in 2 townships, comprising Nga Pitat and Nyaung Bin Seik villages-in Launglon Township and 1 village of Mudu in Yebyu Township.
Applicable Standards	The target for the entire construction period of about 15 months in total for all phases is all complaints are responded by the EPC and filed with the Project Management Office.
Mitigation Measures	Mitigation measures for minimizing physical impacts on the social environment are prescribed in relevant sub-plans, such as air quality, noise, traffic, navigation and marine ecology. Mitigation measures in this sub-plan are community measures designed to support the implementation of the physical measures. The basic requirement is that the communities have access to the communication and complaints process to address and respond to their complaints related to the construction impacts on their daily living and properties. **Local Economy** • Priority should be given to local employment, especially the villages close to the construction site; e.g. Nga Pitat, Nyaung Bin Seik and Mudu. • The recruitment process should be fair and transparent and wage rates are commensurate with experiences and qualifications.

Element	Content
	• The employment conditions will need to comply with the requirements in the national labor law, the social security law and standard wage rate, and other applicable laws and regulations. • The Project Proponent should establish good relationship with the locals and provide the locals with timely information about the project, likely impacts and mitigation measures, and procedures to address local concerns and grievances. • Disclose relevant information before the construction of major components and during the construction through such methods as: - Information billboard - Information disclosure via village headmen or village community leaders • Conduct attitude surveys to collect information on local concerns, issues, and problems of the communities (200 samples within 3 villages and one community). **Amenity and Community Life** • Liaise with key stakeholders and the community through a public consultation process to ensure insignificant impacts of the construction on community facilities, schools and monastery. • As soon as its practicable after the completion of construction, the Contractor shall reinstate community facilities affected by the works, if any. **Social Infrastructure** • Consult with managers of community facilities in neighborhoods adjacent to work sites to develop effective mitigation strategies and maintain regular communication with these facility managers. **Complaints and Corrective Actions (Grievance Redress Process)** A grievance redress process is proposed as mechanism for ensuring that public complaints and concerns related to the LNG Terminal construction will be effectively addressed as quick as possible. The detail are described as follow: • Prepare Grievance Redness system to collect complaint information and solve the problem during project development • Develop an effective and responsive system for receiving, handling and responding to, complaints received during the construction of project works. • Ensure complaints are received and responded to on a 24-

Element	Content
	hour per day basis for the duration of the construction phase. • Provide reporting on complaints received, responses provided, timeliness of responses, and corrective actions taken on a monthly basis. • Raise community awareness of the complaints systems and procedures through public notifications and website facilities. **Early Consultation** • Initiate consultation with owners and occupants of directly affected properties and nearest neighbors to construction activities as soon as practicable before commencing the construction. • Conduct consultation and community information strategies in conjunction with the public or community consultation process. • Establish a tripartite committee to provide mechanism and channel for the committees to participate in the project environmental management. **Community Consultation Program** • Undertake and maintain a comprehensive community information program to inform residents, businesses, community groups and motorists of Project activities and potential impacts. Effective and accessible consultation measures are required including maintenance of a 24-hour contact line operated by a person with authority to stop works if goals and agreements with the community are not met. • Ensure medical facilities, community centers, monastery and schools in the area have access to construction updates and community education during the construction. **Regional Communication** • Monitor traffic volumes and traffic congestion affecting the district and township population during construction and if necessary adopt travel demand and signal stage management strategies.
Monitoring	• Consultation with three village include Nga Pitat, Mudu, and Nya Binsiek to collect information include local concerns, issues, and problems during pre-construction and construction phase at least 1 time per three months • Evaluate effectiveness of consultation, liaison and mitigation outcomes. • Cases of conflicts between the construction workers and local people. • Survey and report on actual impacts of the construction on community amenities and infrastructure.

Element	Content
	• Report community consultation's activities and on consultation, liaison and environmental compliance and public transport access in work site neighborhoods.
Reporting	• Results of the social management will be included in the monthly monitoring reports and the twice a year reports for submission to MONREC. • Report immediately in case of a safety incident or complaint from a neighbor.
Area	• Three Affected Villages (Nga Pitat, Mudu, and Nya Binsiek)
Responsible Agency	• Project developer • Sub-contractor
Estimate Cost	• Cost include in the budget for Natural Resources Used Monitoring Plan

APPENDIX 6A-14

CULTURAL TRADITION MANAGEMENT PLAN

Element	Content
Objective	• To minimize impact during move of shrine. • To minimize impact in case of archaeological artifacts are found • To minimize impact on culture tradition
Performance Indicator	• Problem and successful on moving of shrine. • Number of grievances or complaints filed with the Project Management Office of the Project Proponent • Number of complaints successfully responded
Mitigation Measures	**Conflicts Related to Differences in Cultures and Traditions** • All project personnel should be made aware of local cultures, traditions and norms. • A code of conduct should be put in place for workers to strictly observe when interacting with locals, including restriction to movement outside of the campsite after designated time. • The Project Proponent should establish good relationship with the locals and actively support and participate in traditional and cultural events. • During the construction, the concerned authorities will be immediately informed if archaeological artifacts are found. • The developer must be discuss with local communities on alternative area for moving of shrine • The moving of shrine must follow with local tradition and developer must be support on moving of shrine **Cultural and Archeological Sites** • The Project Proponent should consult with the local communities regarding relocation of the shrine to a new location chose by the local communities. The Project Proponent should provide supports to relocate the shrine. • The concerned authorities will be immediately informed if archaeological artifacts are found during the construction.
Monitor	• Site inspection three time include before moving shrine, during moving shrine and after moving shrine
Reporting	• Results of site inspections will be included in the environmental monitoring reports and submitted to MONREC and Port Authorities Department.

Element	Content
Area	• Shrine inside project site • Village surrounding project site
Responsible Agency	• Project developer
Estimate Cost	• Approx. 15,000 USD

APPENDIX 6A-15

EMERGENCY MANAGEMENT PLAN

(FLOOD, TSUNAMI AND CYCLONE)

Element	Content
Objectives	• To minimize impacts in case of emergency during construction phase. • To acknowledge and raise awareness of construction workers to evacuate, shelter or lockdown can save lives.
Performance Indicator	• Number of employees/workers/staff understand about emergent situation and know how to minimize/survive from the hostile situation (flood, tsunami and cyclone). • Conduct a test (pre-test and post-test) to evaluate their understanding.
Mitigation Measures	• Provide training program about emergency plan before commencing construction activities
Monitor	• Results of pre-test and post-test of construction workers (2 times throughout construction phase).
Reporting	• Results of pre-test and post-test directly reporting to project developer.
Area	• Project sites.
Responsible Agency	• Project developer • Construction workers
Estimate Cost	• Include cost for pre-construction and construction.

APPENDIX 6A-16

EMERGENCY MANAGEMENT PLAN IN CASE OF FIRE ACCIDENT

Element	Content
Objectives	• To minimize impacts in case of fire accident emergency during construction phase.
Performance Indicator	• Number of staff understand about emergent situation and know how to minimize/survive from the hostile situation • Conduct a test (pre-test and post-test) to evaluate their understanding.
Mitigation Measures	• Measures for Addressing Faulty Design and Defects in the Equipment, Equipment Installation, and Operation • Measures for Addressing Inadequacies in the Operation and Maintenance Procedures, and Human Error in the Operations and Maintenance • Provide training program about emergency plan in orientation program. • Practice emergency plan every year taught by experts.
Monitor	• Results of pre-test and post-test of workers (understanding and application of knowledge) twice a year. • Checking firefighting equipment approximately once a month
Reporting	• Results of pre-test and post-test/yearly emergency practice, directly reporting to project developer.
Area	• Project sites (onshore and offshore).
Responsible Agency	• Project developer • Operation staff
Estimate Cost	• include on construction cost

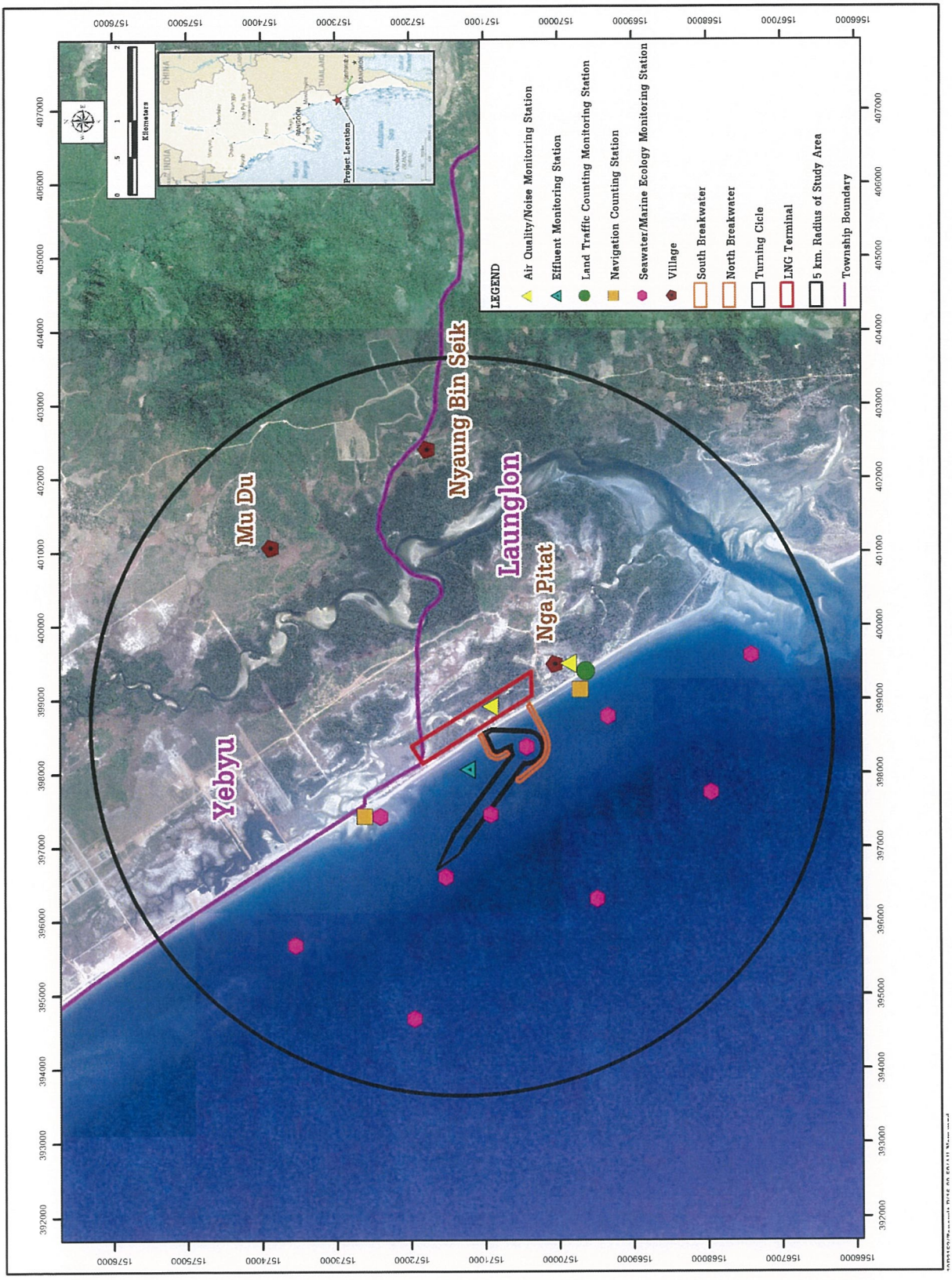


FIGURE 2 : MONITORING STATION DURING PRE-CONSTURTCION / CONSTRUCTION PHASE

APPENDIX 6B

TENTATIVE ENVIRONMENTAL INCIDENT REPORT FORM PRE-CONSTRUCTION AND CONSTRUCTION PHASE

(for guideline only)

APPENDIX 6B

TENTATIVE ENVIRONMENTAL INCIDENT REPORT FORM PRE-CONSTRUCTION AND CONSTRUCTION PHASE (for guideline only)

Date of Incident:

Time of Incident:

Construction Site: ☐ Onshore Facility ☐ Approch Channel and Turning Circle
☐ Jetty ☐ Breakwater and Revetment
☐ Other

Type of Incident

Onshore	Offshore
☐ Fugitive Dust	☐ Navigation Accident
☐ Noise	☐ Dredging Accident
☐ Wastewater	☐ Jetty Collape
☐ Construction Waste	☐ Breakwater and Revetment Collape
☐ Hazardous Waste	☐ Natural Disaster
☐ Transportation Accident	☐ Work Accident
☐ Work Accident	☐ Communities conflict with construction work
☐ Fire and Explosion	☐ Conflict to Local Fishermen
☐ None- Compliance with Compliant Redress Requirement	
☐ None- Compliance with Monitoring Requirement	
☐ None- Compliance with Safety Regulation	
☐ Natural Disaster	
☐ Communities conflict with construction work	

Type of Impact

☐ General environmental and Social Affect (To be use where other catagories are not apply)
☐ Local Air Pollution
☐ Land Contamination
☐ Excessive Noise to Sensitive Area
☐ Pollution to Sea or Water Source and Marine EcologyLegal
☐ Local Insanitary Condition
☐ Disturbance and Discomfortable to Communities
☐ Public Safety Risk
☐ Health and Safety of Construction Worker
☐ Breach Condition in the ECC
☐ Project Image
☐ Legal Liability
☐ Financial Fine, Liabilities, Legal Cost, Construction Cost

1) NUMBER OF PEOPLE AFFECTED BY INCIDENT

2) DETAIL OF INCIDENT

2.1) Place of Incident and Related Construction Activities

2.2) Area Affected By Incident

2.3) Actual and Suspect Couse

2.4) Person Who Report Incident

2.5) Estimated Cost Incurred by Incident

3) CLASSIFICATION OF INCIDENT

☐ High Severty
☐ Medium Severty
☐ Low Severty

4) INCIDENT INVESTIGATION DETAIL

4.1 Incident Investigation Undertaken ☐ yes ☐ no

4.2 Detail of Action Taken

Completed By

Name	Signature	Position	Date

APPENDIX 6C

OUTLINE OF CONTRACTOR'S ENVIRONMENTAL MANAGEMENT PLAN

(for guideline only)

APPENDIX 6C

OUTLINE OF CONTRACTOR'S ENVIRONMENTAL MANAGEMENT PLAN[1]

(for guidance only)

1. INTRODUCTION

The introduction of the Contractor's EMP should include:

- A brief description of the project and the contract
- The contractor's environmental objectives
- An explanation of the role of the Contractor's EMP and how it will be used during pre-construction and construction to achieve the project's environmental and social (ES) objectives.

2. ENVIRONMENTAL MANAGEMENT SYSTEM

The contractor shall provide details of the ES management system (ESMS) to apply during the contract.

The basic elements of the contractor's ESMS to be detailed are likely to include:

2.1 Contractor's ES policy

Include a copy of the policy document and an explanation of how the policy will apply to the project.

2.2 Project organisation chart

An organisational chart showing the reporting/responsibility relationships, position titles and personnel, including subcontractors, should be included. The personnel with specific site ES management responsibility should be highlighted.

2.3 Training, awareness and competence

Describe how the organisation training policy will apply to this contract to ensure that all employees and subcontractors are aware of and adequately trained to discharge their environmental responsibilities. A specific site briefing prior to commencement of works shall occur.

[1]Modified from Appendix A, Contractor's Environmental Management Plan Guidelines for Construction-Road, Rail and Marine Facilities, Government of South Australia Government, Revision 2 February 2009

2.4 ESMS documentation

Provide documented details of the system, if available, including any manuals, standard report sheets, checklists, etc.

2.5 Document control

Describe the document control system to apply to the contract.

2.6 Checking and corrective action

Describe the procedures to apply to inspection, monitoring and auditing including non-conformance and corrective action.

Procedures applicable for these basic elements should be documented. Existing quality assurance procedures may already respond to issues such as document control and corrective action.

3. CONTRACTOR'S EMP SCHEDULE

Schedules may be presented under two categories, namely:

- Specific response to the Project EMP
- Best practice response.

Best practice responses should be detailed, particularly when a project-specific Project EMP is not developed.

Plans can either be issue based or activity based. The Project ESMP is issue based with headings such as construction wastes, labour and working condition, and fugitive dust.

An activity based plan would be likely to have headings such as vegetation clearance, excavation, topsoil removal, demolition, dredging and drainage works, etc.

The contractor shall include an inspection, monitoring and audit plan based on the Contractor's EMP Schedules. These are essential in order to establish if the contractor's performance has achieved the project objectives. The Contractor's EMP must be relevant to the site activities and effectively implemented and managed. Inspections, monitoring and auditing will provide the basis to implement corrective action and to ensure the environmental outcomes are achieved. Resultant action may involve upgrading the Contractor's EMP, changing procedures, training staff or providing additional or repositioning controls.

APPENDIX 7A

SUB-PLANS FOR OEMP

APPENDIX 7A-1

MANGROVE REHABILITATION MANAGEMENT PLAN

Element	Content
Objective	• To monitor the activities of rehabilitate mangrove forest resources
Performance Indicator	• Types and number of flora species in mangrove rehabilitation area
Mitigation Measures	• Planting, checking and evaluating fertilities in mangrove rehabilitation area and around project site. • Plant additional mangroves during maintenance. • Mangrove rehabilitation program should be involve local villagers participates in prepare seeding, and maintain the areas. Developer should provide appropriate budget for this activity. • Give a brief orientation for collectors/visitors (for educational and recreational purposes) about mangrove forest and other relevant topics for rehabilitation plan. • Maintenance program for the rehabilitation area.
Monitoring	• Monitor on mangrove rehabilitation area and forest area around project site. - Frequency : 2 times/year during 1^{st}-10^{th} years of operation phases
Reporting	• Results of site inspections will be included in the environmental monitoring reports and submitted to MONREC and Port Authorities Department.
Area	• Mangrove rehabilitation area (investigating for the appropriate area).
Responsible Agency	• Project developer (CSR Team)
Estimate Cost	• 350,000 USD lump sump for planting and maintenance in reforestation area during 1^{st}-10^{th} of operation phases. • 1,000 USD / year for support local villagers (from Nga Pitat and Nyua Binseik Villages) in rehabilitation activities (during 1st-10th years during operation phase, total cost 10,000 USD)

APPENDIX 7A-2

MAINTENANCE DREDGING AND DISPOSAL MANAGEMENT PLAN

Element	Content
Objective	To ensure that maintenance dredging activities are not create or minimize impact to both coastal water and marine ecology.
Performance Indicators	Qualities of the coastal water during maintenance dredging activities compared with the applicable coastal water quality standards.
Sources	• Dredged material during maintenance period
Applicable Standards	**Coastal Water Quality Standard:** • Marine water quality criteria for the ASEAN Region for aquatic life protection, 2008 - DO = >4 mg/L - Suspended solid = < 50 mg/L - Nitrate-Nitrogen = <60 µg/L
Mitigation Measures	**Design Concept** The Developer will prepare detailed design of maintenance dredging and disposal activities. The proposed design concept is same as during operation phase as described below: • **Vessel for Dredging Activities** • Disposal vessels should be equipped with accurate positioning systems, e.g. with AIS (Automatic Identification System), which shall be switched on during disposal operations. Disposal vessels and operations should be inspected regularly to ensure that the conditions of the disposal permit are being complied with, and that the crews are aware of their responsibilities under the permit. Ships' records and automatic monitoring and display devices (e.g. black-boxes), where these have been fitted, should be inspected to ensure that the disposal is taking place at the specified site. • The following typical methods are available to reduce plume generation when dredging with a TSHD (Total Suction Hopper Dredger): - Optimize trailing velocity, suction mouth and pump discharge rates. This results in less spillage from the drag head. - Limit overflow and/hopper filling. This is sometimes imposed on dredging operations but slows the dredging process, and increases costs significantly. - Reduce intake water. This results in more in-situ material being taken into the dredge. This increases costs as the fuel requirement per m^3 rises. The effect on the production rate is controlled by pumping at a higher rate. - Reduce air content in the overflow mixture.

Element	Content
	• The following typical methods are available to reduce plume generation when dredging with a CSD (Cutting Suction Dredger): - Optimize cutter speed, swing velocity and suction discharge. This reduces the spill rates at the cutter head, as more in situ material is taken up at the cutter head. This method will also optimize production rates and it should be the most cost effective method of dredging with a CSD. - Optimize cutter head design. This method requires a high level of detail of the soil characteristics to be removed. The method also optimizes production rates and it should be the most cost effective method of dredging with a CSD. • The following typical methods are available to reduce plume generation when dredging with a Backhoe dredge. - Use of a visor over the bucket. This is a relatively cost effective method, but does reduce production rates and thus increase overall Project costs. - Use of a silt screen. Silt screen scan under certain conditions can be used to minimize the impact of spilled dredge materials. They need to be moved carefully, and can considerably slow down production rates. If they are not used correctly, they are ineffective. • **Dredging** • Use techniques to minimize adverse impacts on aquatic life from the re-suspension of sediments; • The project developer/contractor must establish the baseline coastal water quality around the dredging and disposal area by conducting daily monitoring program at least 3 months prior to dredging activities. • The dredging activities must be stopped if total suspended solid exceeds 50 mg/L at any time. • Check and maintenance sediment transfer pipe daily to ensure proper condition and prevent pipe damage cause of sediment spill into sea. • In case of damage on sediment pipe, the dredging activities must be stopped. • Prepare wave gauge, tide gauge, and anemometer to establish long term environmental information in this project area. • Check and maintenance all machine and equipment to prevent oil leakage into sea. • Check and maintenance TSHD and CSD to ensure that no sediment overflow into the sea.

Element	Content
	• Project Engineering should strictly control and prohibit contractor to dispose sediment from dredging activities into the sea and outside designated disposal area. • The monitoring results on coastal water quality must be sent to all concerned agencies. • Consider timing to dredge at most favorable paints in the tidal cycle to minimize the turbidity plume. • Use silt curtain where practicable. • Consider timing of dredging to avoid sensitive period for marine animals. • **Disposal** • Avoid off shore disposal activities to prevent impact on coastal water quality and marine ecology. • Use the dredged materials for on-land disposal within the Early Industrial and for beach nourishment to the maximum extent. • **Marine Ecology** • Apply the same mitigation measures as recommended for coastal water quality. • Provide information on the operation schedule and area to local fishermen living near the port such as Pan Tin In, Sakhanthit, Muangmagan and Nga Pitat villages. • Coordinate with local authorities to protect coral and other marine resources.
Monitoring	• Twice a year collection of 10 sampling stations of coastal water throughout operation phase at location around access channel especially during maintenance dredging activities and after finish maintenance dredging • Twice a year collection of 10 sampling stations (same as for coastal water) during maintenance dredging activities and after finish maintenance dredging. The Parameter include Plankton, Benthos, fishery and marine protected species
Reporting	• The results of monitoring will be presented in the monitoring reports. • Twice a year reporting on maintenance dredging and disposal, and submit to MONREC and Port Authorities Department.
Area	• Maintenance Dredging Area include Approach channel, Turning Cycle • Surrounding of maintenance dredging area (Andaman Sea)
Responsible Agency	• Project developer (maintenance Team)
Estimate Cost	• 500 USD /station/time for coastal water quality measurement • 1,000 USD/station/time for marine ecology and protected species.

APPENDIX 7A-3

NAVIGATION MANAGEMENT PLAN

Element	Content
Objective	• To minimize potential impacts from navigation activities to the local fishermen during operation phase
Performance indicators	• Number of navigation accident in the identified impact areas • Number of vessels during the operation phase.
Sources	• Navigation disturbances could be caused by haulage of materials, equipment for related project in Early Industrial Phase, and maintenance dredging activities. • Potential impact areas: - Navigation Route of LNG Carriers ; - Approach Channel of LNG Terminal
Management guidelines	• Take reasonable and practicable measures to avoid, or mitigate and manage the potential navigation impacts on navigation route of local fishermen near the worksites. • Minimize as far as reasonably practicable, potential navigation disruptions to the operation of the navigation route due to the transport of materials to and maintenance dredging activities.
Mitigation Measures	• The port will have a vessel traffic management system to ensure navigation safety and keep records of vessels calling at the port. • The navigation area will have adequate number of buoys and signs to clearly indicate the navigation channel and the port boundary.
Monitoring	• Monitor number of vessel and boat two time per year at River mouth of Britney Creek • Monitor navigation accident situation related to the project every day at LNG Terminal.
Reporting	• Monthly report on navigation conditions, including any accidents. • Twice a year reporting on navigation performance, and submission to MONREC and Port Authorities Department.
Area	• River mouth of Britney Creek
Responsible Agency	• Project developer
Estimate Cost	• 500 USD/station/time for monitoring number of vessel and boat at River mouth of Britney Creek throughout operation phase • Cost for monitoring navigation accident situation related to the project include on cost for operation.

APPENDIX 7A-4

SHORELINE EROSION MANAGEMENT PLAN

Element	Content
Objective	To minimize erosion and accretion impact on the beach along two breakwaters.
Performance Indicators	Erosion and accretion rate of beach along two breakwaters.
Mitigation Measures	• Recheck and reclaim sand (beach nourishment) on the eroded beach around the shoreline of Project site every year. • Based on limited physical and environmental information available, as well as engineering judgment, Regular shoreline monitoring is recommended to gain the necessary information and prepare the setback line or beach erosion protection with hard structure such as groynes if high erosion on the shoreline.
Monitoring	• Twice a year monitor on beach profile and bathymetric survey at 5 km of north and 5 km of south of beach along the port development • Monthly checking shoreline erosion at 5 km of north and 5 km of south of beach along the port development
Reporting	• The results of monitoring will be presented in the monitoring reports. • Twice a year reporting on beach erosion, and submit to MONREC and Port Authorities Department.
Area	• Project site (shoreline)
Responsible Agency	• Project developer
Estimate Cost	• 750,000 USD lump sump (approx. 10,000 USD / year) for shoreline erosion control throughout operation phase • 10,000 USD / time for beach profile monitor yearly throughout operation phase

APPENDIX 7A-5
OHS MANANGEMENT PALN

Element	Content
Objective	To establish best practicable OSH conditions to ensure work related health and safety of operational personnel.
Performance Indicators	• Total Recordable Injury Frequency Rate (TRIFR) • Lost Time Injury Frequency Rate (LTIFR) • Medical Treatment Injury Frequency Rate (MTIFR) • Duration rate • Incident rate
Sources	Issues of concern: excessive noise and temperature inside the project area, fire and explosion risks.
Applicable Standards	OHS guidelines and standards enforced by the Ministry of Health and proposed for this Project as follows:
Mitigation Measures	**Design and Equipment Selection** (1) Incorporate in the EPC contract, all OHS requirements that the EPC contractor will in the design of the project and associated facilities, including equipment selection; give due consideration to, but not limited to, the following OHS requirements: (i) integrity of workplace structures; (ii) standard operating procedures for process shutdown, including emergency plan; (iii) work space and exit; (iv)fire precautions; (v) toilets and showers; (vi) potable water supply; (vii) clean eating area; (viii) lighting; (ix) safe access; (x) first aid; (xi) air supply and ventilation; (xii) work environment temperature; (xiii) noise and vibration; (xiv) electrical safety; (xv) fire and explosions; and (xvi) confined working space. (2) The EPC contractor will be required to prepare for consideration of the Project Proponent an OHS management plan and implementation procedures specific to the area of this Project and in line with the Owner's OHS policy and procedures. The OHS management plan and implementation procedures will be submitted not later than one month before commissioning of LNG Terminal and associated facilities. (3) The OHS management plan and implementation procedures will cover but not limited to the following subjects: • Organization and responsibilities of OHS management • Training plan • Communication plan • Contractor responsibilities

Element	Content
	• Safety measures for the LNG Terminal's O&M, including-safety in project operations, fire, explosion, and chemical hazards. • Emergency response procedures. • Task-specific work requirements Compliance monitoring and evaluation plan • Audit plan • Reporting system • Documentation system **During Project Commissioning** During project commissioning, the EPC contractor will be required to conduct necessary orientation and training to the Owner's LNG terminal operational team to ensure that the operational team clearly understands the OHS plan and implementation procedures. **During Operations** The Plant Manager will implement the OHS plan and procedures as part of his operational control and management. The EHS Manager will monitor the implementation of OHS procedures to comply with relevant requirements.
Monitoring	Monitoring of OHS performance of the Contractor will be made through: • Daily informal inspections (walk through of the construction sites) • Weekly formal inspections of the work place. • Monthly formal inspections of the work place. • Audits • Corrective Action Reports The daily inspections will observe: (i) adherence of the operational personnel to the OHS procedures such as wearing of protective equipment in high risk working areas; (ii) working conditions; (iii) readiness of fire and life safety systems as relevant; and (iv) potential new hazards. The daily inspections will be carried out by the EHS Manager, the Operational Manager, and relevant unit heads. The Manager will occasionally join the daily inspections. The EHS Manager will prepare daily OHS inspection notes as part of the site inspection notes. The weekly formal inspections will be carried out at weekly intervals and shall be documented using appropriate "Weekly OHS Inspection Checklists". The EHS Manager and the

Element	Content
	Operational Manager will carry out the weekly inspections. The weekly inspections will include the same issues as the daily inspections but will be in more details and quantitative. The monthly formal inspections will review the OHS performance of the month based on results of the weekly inspections. Progress in addressing issues or problems identified in the precedent weekly inspections will be evaluated. Internal audits will be carried out annually or more frequent if the OHS performance is significantly below established targets. The internal auditor or team will be engaged by the LNG Terminal company's Board of Directors. Monitoring results will be discussed in monthly review meetings on LNG Terminal performance.
Reporting	• Monthly as part of the monthly monitoring reports except in case of an incident when reporting should occur immediately on completion of any investigation required to resolve the incident. • Results of OHS monitoring will be reported: - Twice a year reports will be submitted to MONREC and Port Authorities in the first five year after commissioning. - Annually report will be submitted to MONREC and Port Authorities throughout the Project life.
Area	• Project site
Responsible Agency	• Project developer (OHS Team)
Estimate Cost	• include operation cost

APPENDIX 7A-6

SOCIAL ENVIRONMENT MANAGEMENT PLAN

Element	Content
Objective	Avoid or mitigate and manage operation impacts on the social environment. *Note: The social environment includes residential and neighborhood amenity, connectivity, community health, community diversity, social infrastructure provision, livelihood and safety.*
Performance Indicators	Number of grievances or complaints filed with the Project Management Office of the Project Proponent Number of complaints successfully responded
Sources	Daily living of people in the surrounding communities may be disturbed or inconvenienced by environmental disturbances caused by the operation such as noise, air quality, navigation not satisfaction with marine resources utilization. The management of social environment will cover 3 villages in 2 townships, comprising Nga Pitiat and Nyaung Bin Seik villages-in Launglon Township and 1 village of Mudu in Yebyu Township.
Applicable Standards	The target for the entire operation period of about 50 years is all complaints are responded by the EPC and filed with the Project Management Office.
Mitigation Measures	Mitigation measures for minimizing physical impacts on the social environment are prescribed in relevant sub-plans, such as noise, air quality and wastewater management. Mitigation measures in this sub-plan are community measures designed to support the implementation of the physical measures. The basic requirement is that the communities have access to the communication and complaints process to address and respond to their complaints related to the construction impacts on their daily living and properties. Establish the CSR Program to implement and support public relations and mitigation measures. **Resource Used Management** • Continue the implementation of long term livelihood restoration measures proposed in the pre-construction phase. • Continue through provision of knowledge for strengthening occupation career as proposed during pre-construction phase • Conduct attitude survey to collect information on local concerns, issues, and problems of the communities in the new alternative fishing ground and boatyard area (should be all household in Nga Pitat Village)

Element	Content
	Amenity and Community Life • Liaise with key stakeholders and the community through a public consultation process to ensure insignificant impacts of the construction on community facilities, schools and monastery. • As soon as its practicable after the completion of construction, the Contractor shall reinstate community facilities affected by the works, if any. **Social Infrastructure** • Consult with managers of community facilities in neighborhoods adjacent to worksites to develop effective mitigation strategies and maintain regular communication with these facility managers. **Complaints and Corrective Actions (Grievance Redress Process)** A grievance redress process is proposed as mechanism for ensuring that public complaints and concerns related to the LNG Terminal operation will be effectively addressed as quick as possible. The detail are described as follow: • Develop an effective and responsive system for receiving, handling and responding to complaints received during the construction of project works. • Ensure complaints are received and responded to on a 24-hour per day basis for the duration of the construction phase. • Provide reporting on complaints received, responses provided, timeliness of responses, and corrective actions taken on a monthly basis. • Raise community awareness of the complaints systems and procedures through public notifications and website facilities. **Early Consultation** • Initiate consultation with owners and occupants of directly affected properties and nearest neighbors to construction activities as soon as practicable before commencing the construction. • Conduct consultation and community information strategies in conjunction with the public or community consultation process. • Establish a tripartite committee to provide mechanism and channel for the committees to participate in the project environmental management. **Community Consultation Program** • Undertake and maintain a comprehensive community information program to inform residents, businesses,

Element	Content
	community groups and motorists of Project activities and potential impacts. Effective and accessible consultation measures are required including maintenance of a 24-hour contact line operated by a person with authority to stop works if goals and agreements with the community are not met. • Ensure medical facilities, community centers, monastery and schools in the area have access to construction updates and community education during the construction. • Support on development program such as electricity supply, improve on local road, and fishery program in new alternative fishing ground and boatyard area in CSR Program
Monitoring	• Consultation with three village include Nga Pitat, Mudu, and Nya Binsiek to collect information include local concerns, issues, and problems during pre-construction and construction phase at least 2 times per year during 1st-5th of operation phase and 1 time per year during 6th- throughout operation. • Evaluate effectiveness of consultation, liaison and mitigation outcomes. • Conduct Attitude survey at Nga Pitat Village about new fishing ground and boat yard area twice a year during 1st-5th of operation phase • Survey and report on actual impacts of the operation on community amenities twice per year during 1st-5th of operation phase and once a year throughout operation. • Report community consultation's activities and on consultation, liaison and environmental compliance and public transport access in work site neighborhoods.
Reporting	• Report immediately in case of complaint from a neighbor. • CSR Program will be reported: - Twice a year reports will be submitted to MONREC and Port Authorities in the first five year after commissioning. - Annually report will be submitted to MONREC and Port Authorities throughout the Project life.
Area	• Villagers (PAPs)
Responsible Agency	• Project developer
Estimate Cost	• 150,000 USD lump sump for group interview or village forum at 3 affected villages throughout operation phase • 2,000 USD / year for development fund during 1st-5th years of operation phase • 1,000 USD / year for development fund during 6th - throughout operation phase.

APPENDIX 7A-7

ROLL-OVER STATIC ELECTRIC SPARKING AND RAPID PHASE TRANSITION PREVENTION MANAGEMENT SYSTEM

Element	Content
Objective	• To establish and develop roll-over, static electric sparking, and rapid phase transition prevention system
Performance Indicator	• Record of incidents/accidents in case of roll-over, static electric sparking, and rapid phase transition situation. • Conduct a test (pre-test and post-test) to evaluate their understanding.
Mitigation Measures	**Roll-over** • Consider installation of a system to recirculate the LNG in within the tank. • Install pressure safety valves for tanks designed to accommodate roll over conditions. • Install multiple loading points at different tank levels to allow for the distribution of LNG with different densities within the tank to prevent stratification. • One method is to practice proper transfer procedures to assist in deterring fill-induced stratification. When transferring product into an LNG tank of a different product density, it is prudent to bottom fill the lighter LNG while top-filling heavier product. This procedure will promote a natural mixing of the two product densities. **Static Electric Sparking** • Implementing safety procedures for loading and unloading of product to transport systems (in this case is vessels), including use of fail-safe control valves and emergency shutdown and detection equipment. • Preparation of a formal fire response plan supported by the necessary resources and training, including training in the use fire suppression equipment and evacuation. Procedures may include coordination activities with local authorities or neighboring facilities • Recommend to setting Prevention of potential ignition sources such as: ➢ Proper grounding to avoid static electricity buildup and lightning hazards (including formal procedures for the use and maintenance of grounding connections) ➢ Use of intrinsically safe electrical installations and non-sparking tools

Element	Content
	➢ Implementation of permit systems and formal procedures for conducting any hot work during maintenance activities, including proper tank cleaning and venting, ➢ Application of hazardous area zoning for electrical equipment in design; • Facilities should be properly equipped with fire detection and suppression equipment that meets internationally recognized technical specifications for the type and amount of flammable and combustible materials stored at the facility. **Rapid Phase Transition** • The LNG carriers will be required to implement an effective spill control plan • Design and implement safety procedures for the transfer of LNG from the LNG carriers to the LNG storage tanks. • Prepare an emergency response plan for RPT explosions **Other** • Provide a training program/workshop for case of roll-over and static electric sparking situation.
Monitoring	**Roll-over** • Monitor LNG storage tanks for pressure, density, and temperature all along the liquid column (every day); • Monitoring of total boil-off and heat balance to detect superheating (every day) **Static Electric Sparking** • Monitoring on all equipment to prevent static electric sparking situation (monthly checking). **Rapid Phase Transition** • Monitor storage tank and transfer pipeline in LNG Carrier (everyday)
Reporting	• Results will be included in the environmental monitoring reports and submitted to MONREC and Port Authorities Department.
Area	• Within both onshore and offshore facilities
Responsible Agency	• Project developer
Estimate Cost	• include on operation cost

APPENDIX 7A-8

VESSEL TRAFFIC AND SAFETY MANAGEMENT SYSTEM

Element	Content
Objective	• To establish and develop a vessel traffic system, to build safe working condition of the environment and less effect on other vessel of traffic flow. • To prevent and minimize unexpected incidents/accident during operation phase of LNG Terminal Project.
Performance Indicator	• Record of incidents/accidents.
Mitigation Measures	**Exclusion Zone** • Mitigation measures for this l impact issue should be combined with the mitigation measures for livelihood impacts during the construction phase to form a single livelihood impact mitigation plan. For those affected people who still choose to remain in fishing occupation, a compensation should be considered for their increased travel time and fuel consumption related to routine fishing activities. **Risk Management** The Project Proponent will, as part of the contract, require the EPC contractor to carry out the following tasks: • Submit a detailed plan of navigation route to LNG carrier. • Organize and conduct training of the small port operational team to be nominated by the Project Proponent in the operation and maintenance and risk management of the LNG terminal. The training will use the work procedures prepared by the EPC contractor. After the training, the EPC contractor will conduct a rigorous test of the trainees to evaluate their technical competencies required for efficient and safe operation and maintenance of the project. • In addition to the insurance, the Project Proponent should require the EPC contractor to prepare an emergency response plan to enable the LNG terminal operational team to promptly cope with the consequences if the operational risk events occur. The content of such plan should include, but be limited to the following: - Background and Purpose of the Emergency Response Plan - Types, Nature and Locations of Emergencies (on-site and off-site) - Emergency Response Organization - Emergency Response Process and Work Procedures - Notification Procedures and Communication Systems - Damage Assessment Process - Process and Procedures for Returning to Normal Operations

Element	Content
	- Emergency Equipment and Facilities Available - Training, Simulation and Mock-Drills - Regular Tests of Emergency Organization and Procedures - Review of Plans and Updates **Other** • Provide a training program/workshop.
Monitoring	• Monitor on traffic system (effectiveness and safety) within the LNG Terminal and other vessel traffic system connected to the project area.
Reporting	• Results will be included in the environmental monitoring reports and submitted to MONREC and Port Authorities Department.
Area	• Within offshore area (project site and other vessel traffic system)
Responsible Agency	• Project developer (Navigation/traffic Team)
Estimate Cost	• include on operation cost

APPENDIX 7A-9

OPERATION STAFF MANAGEMENT PLAN

Element	Content
Objective	• To manage staff resources throughout the life of project. • To ensure that sufficient staff processing the correct skill sets and experience to ensure a successful project completion.
Performance Indicator	• Operation staff meet the target/goal of proposed plan (percentage). • Results/products meet the standard requirement used for the Small Port Project.
Mitigation Measures	• Provide a training program for operational staff. • Incentive idea for achieving goals.
Monitoring	Set Key Performance Indicators (KPIs) for operation staff (individual staff or department).
Reporting	• Results will be included in the environmental monitoring reports and submitted to MONREC and Port Authorities Department.
Area	• Project site/or outside.
Responsible Agency	• Project developer (HR Team)
Estimate Cost	• include on operation cost

APPENDIX 7A-10

EMERGENCY MANAGEMENT PLAN (FLOOD, TSUNAMI AND CYCLONE)

Element	Content
Objectives	• To minimize impacts in case of emergency during operation phase. • To acknowledge and raise awareness of operation staff to evacuate, shelter or lockdown can save lives.
Performance Indicator	• Number of staff understand about emergent situation and know how to minimize/survive from the hostile situation (flood, tsunami and cyclone). • Conduct a test (pre-test and post-test) to evaluate their understanding.
Mitigation Measures	• Provide training program about emergency plan in orientation program. • Practice emergency plan every year taught by experts.
Monitor	• Results of pre-test and post-test of construction workers (understanding and application of knowledge) (2 times per year).
Reporting	• Results of pre-test and post-test/yearly emergency practice, directly reporting to project developer.
Area	• Project sites (onshore and offshore).
Responsible Agency	• Project developer • Operation staff
Estimate Cost	• include on operation cost

APPENDIX 7A-11

EMERGENCY MANAGEMENT PLAN IN CASE OF GAS LEAKAGE

Element	Content
Objectives	• To minimize impacts in case of gas leakage emergency during operation phase.
Performance Indicator	• Number of staff understand about emergent situation and know how to minimize/survive from the hostile situation • Conduct a test (pre-test and post-test) to evaluate their understanding.
Mitigation Measures	• Measures for Addressing Faulty Design and Defects in the Equipment, Equipment Installation, and Operation • Measures for Addressing Inadequacies in the Operation and Maintenance Procedures, and Human Error in the Operations and Maintenance • Provide training program about emergency plan in orientation program. • Practice emergency plan every year taught by experts.
Monitor	• Results of pre-test and post-test of workers (understanding and application of knowledge) twice a year.
Reporting	• Results of pre-test and post-test/yearly emergency practice, directly reporting to project developer.
Area	• Project sites (onshore and offshore).
Responsible Agency	• Project developer • Operation staff
Estimate Cost	• include on operation cost

APPENDIX 7A-12

EMERGENCY MANAGEMENT PLAN IN CASE OF FIRE ACCIDENT

Element	Content
Objectives	• To minimize impacts in case of fire accident emergency during operation phase.
Performance Indicator	• Number of staff understand about emergent situation and know how to minimize/survive from the hostile situation • Conduct a test (pre-test and post-test) to evaluate their understanding.
Mitigation Measures	• Measures for Addressing Faulty Design and Defects in the Equipment, Equipment Installation, and Operation • Measures for Addressing Inadequacies in the Operation and Maintenance Procedures, and Human Error in the Operations and Maintenance • Provide training program about emergency plan in orientation program. • Practice emergency plan every year taught by experts.
Monitor	• Results of pre-test and post-test of workers (understanding and application of knowledge) twice a year. • Checking firefighting equipment approximately once a month
Reporting	• Results of pre-test and post-test/yearly emergency practice, directly reporting to project developer.
Area	• Project sites (onshore and offshore).
Responsible Agency	• Project developer • Operation staff
Estimate Cost	• include on operation cost

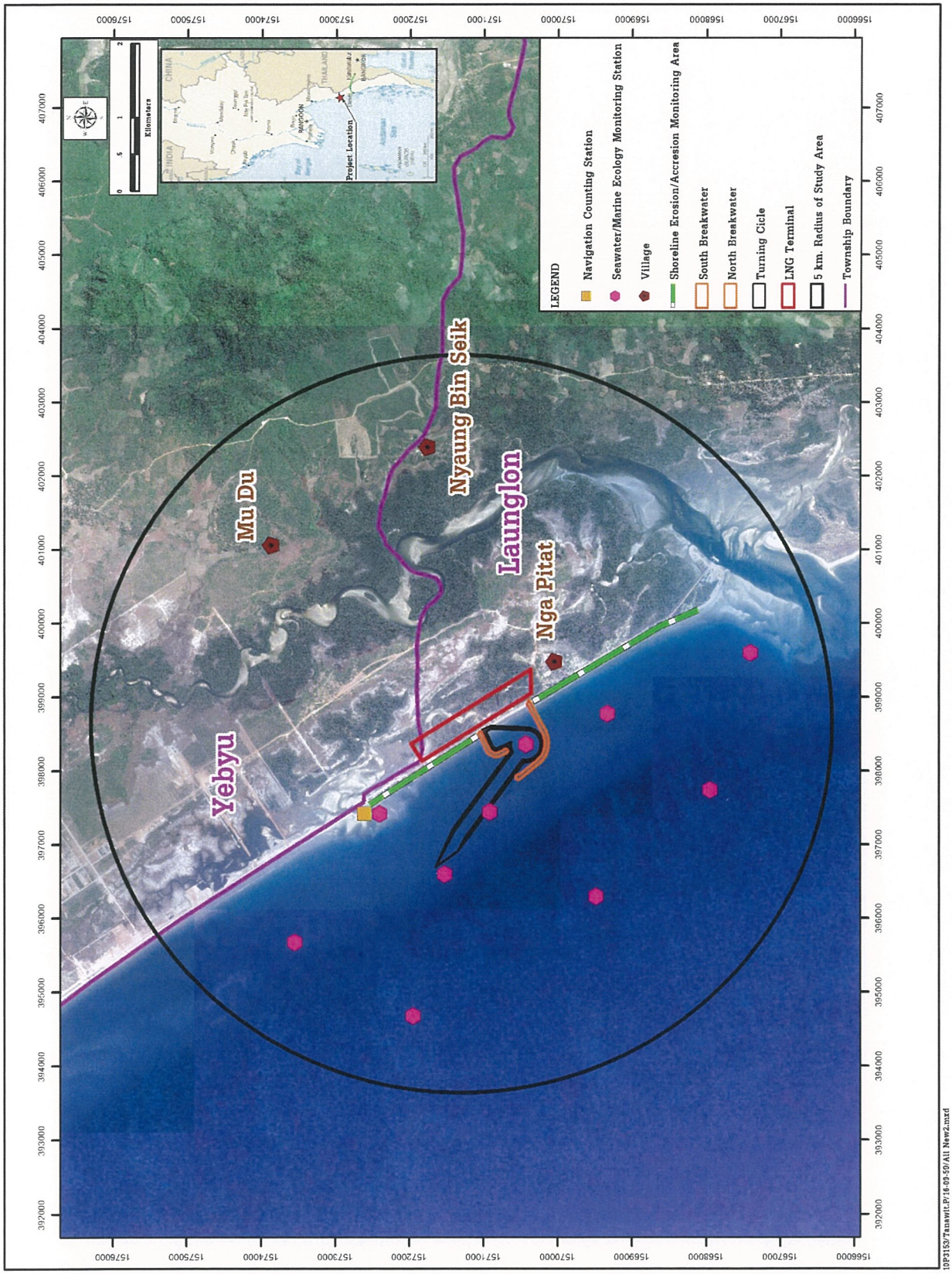


FIGURE 1 : MONITORING STATION DURING OPERATION PHASE

APPENDIX 7B

TENTATIVE ENVIRONMENTAL INCIDENT REPORT FORM OPERATION PHASE

(for guideline only)

APPENDIX 7B

TENTATIVE ENVIRONMENTAL INCIDENT REPORT FORM OPERATION PHASE (for guideline only)

Date of Incident:
Time of Incident:

Type of Incident

Onshore	Offshore
☐ Noise	☐ Navigation Accident
☐ Wastewater	☐ Dredging Accident
☐ Solid Waste	☐ Jetty Collape
☐ Hazardous Waste	☐ Breakwater and Revetment Collape
☐ Transportation Accident	☐ Gas Leakage from LNG Carrier or FSU
☐ Shoreline Erosion/Accresion	☐ Natural Disaster
☐ Work Accident	☐ Work Accident
☐ Fire and Explosion	☐ Fire and Explosion at LNG Carrier or FSU
☐ Gas Leakage at Storage Tank or Ambient Air Vaporizer or Gas Pipeline	☐ Conflict to Local Fishermen
☐ Chemical Leakage	☐ Air Emission from LNG Carrier
☐ None- Compliance with Compliant Redress Requirement	
☐ None- Compliance with Monitoring Requirement	
☐ None- Compliance with Safety Regulation	
☐ Natural Disaster	

Type of Impact

☐ General environmental and Social Affect (To be use where other catagories are not apply)
☐ Local Air Pollution
☐ Land Contamination
☐ Excessive Noise to Sensitive Area
☐ Pollution to Sea or Water Source and Marine EcologyLegal
☐ Local Insanitary Condition
☐ Disturbance and Discomfortable to Communities
☐ Public Safety Risk
☐ Health and Safety of Construction Worker
☐ Breach Condition in the ECC
☐ Project Image
☐ Legal Liability
☐ Financial Fine, Liabilities, Legal Cost, Construction Cost

1) NUMBER OF PEOPLE AFFECTED BY INCIDENT

2) DETAIL OF INCIDENT

2.1) Place of Incident and Related Construction Activities

2.2) Area Affected By Incident

2.3) Actual and Suspect Couse

2.4) Person Who Report Incident

2.5) Estimated Cost Incurred by Incident

3) CLASSIFICATION OF INCIDENT

□ High Severty
□ Medium Severty
□ Low Severty

4) INCIDENT INVESTIGATION DETAIL

4.1 Incident Investigation Undertaken □ yes □ no

4.2 Detail of Action Taken

Completed By

Name	Signature	Position	Date

APPENDIX 8A

EXAMPLE OF EMERGENCY CONTINGENCY PLAN FOR SHIP COLLISION

(FOR GUIDELINE ONLY)

APPENDIX 8A
EXAMPLE OF EMERGENCY CONTINGENCY PLAN FOR SHIP COLLISION (FOR GUIDELINE ONLY)

Action to be taken by the bridge team:

1. Sound the General Alarm and follow this with a public address announcement regarding the situation.
2. Muster all personnel and check for injured persons or any that are missing. Advise the Bridge of the outcome of the muster.
3. Contact the Engine room and advise them of the situation and get an initial report of any damage or leaks that are apparent.
4. Stop engines and engage manual steering (start 2nd steering motor). However, bear in mind the immediate navigation situation. (Other traffic, proximity to shoal patches or other hazards). It may be preferable to maintain minimum steerage way at this stage with hand steering possibly engaged.
5. Give the instruction to close any ballast hatches etc. that may be open, to maintain the watertight integrity of the vessel.
6. At night turn on the deck lights; however, again bear in mind the navigation situation.
7. Utilize VHF Ch16 to advise other ships in the immediate vicinity of the collision using security or Pan Pan. N.U.C. signals may have to be displayed depending on the situation.
8. Ensure that the GMDSS equipment has vessel current position entered, and then send notification of the collision to the nearest MRCC or coast station. Also contact DPA using initial contact via telephone, if DPA not available then other members of the control group should be contacted. Contact details are available in the S.M.P.E.P. Appendix III.
9. Contact the other vessel and ascertain if she requires assistance or needs us to standby her and note protest.
10. Prepare lifeboats for the evacuation of non-essential personnel.
11. The following information should be recorded

a) Mark Engine Room Data logger
b) Mark Course Recorder
c) Note Time of Contact
d) Note Vessels Position
e) Note Bridge Times
f) Note Course & Speed at Time of Contact
g) Note Angle of Contact
h) Note Times of all Sound Signals Made and Heard
i) Check if other Vessels require Assistance or require our Vessels to Standby
j) Obtain particulars of other vessels
k) Hold other vessels responsible by Letter
l) Note Protest
m) Witnesses Names
n) Notify Anticipated Delay

12. Endeavour to find out from other vessel the following information and likewise advise the other vessel of our similar details: a) Vessels name b) Port of registry c) Where from d) Where bound e) Owners / Charterers / agents
13. Establish and enter the following in the Deck Operations Log, if not already noted: a) Exact position of collision b) Exact time of collision c) Course and speed at time of contact d) Angle of contact with other vessel e) Details of any sound signals made or heard prior to the collision f) Transcripts of any communications to or from the other vessel g) Mark the course recorder chart with the time of collision
14. Issue the other Master with a Letter holding him responsible for the collision.
15. Make a record of all witnessing vessels / parties.
16. As soon as practicable after the event all personnel on duty or directly involved in the incident should submit to a drug and alcohol test
17. Note Protest when vessel arrives at next port of call.
18. Check that bridge and engine times noted for the time of contact and subsequent movements agree. If they do not, make an entry in the Deck Operations Log and ER Movement Book noting the disparity.
19. Whilst all the above is being carried out there must, be someone who is keeping an accurate and complete log of all that is occurring. In the absence of a direct order to the contrary, the Third Officer shall compile the log and be responsible for its accuracy. Remember, at an enquiry this log account of the happenings will provide one of the strongest pieces of evidence for or against us. So let's get it correct. Any mistakes or alterations shall be crossed out using only a single line and initialled by the officer making the change. Erasing or 'Tippexing' out entries must not be attempted
20. When the various information has been received from local control, an updated report including the vessels 'Voyage Stability Information' must be sent to the managing office. Note that an updated copy of the vessel stability and stress information, must be made available after every cargo, ballast or bunker operation, and must be updated periodically on extended voyages where there is any significant change in cargo or bunkers.

Action to be taken by deck department:

1. Other members of the ships complement should be checking and reporting in to the bridge control centre on the following information:
2. Check all have mustered
3. If necessary start water pump sprays.
4. The watertight integrity of the hull. This information may be obtained by visual means and by manually sounding all spaces, tanks and compartments, both on deck and in the engine room.
5. The integrity of the cargo and its associated systems including hydraulics pipelines and fuel lines.
6. Check for any signs of leakage of LNG into the interbarrier spaces. (Indications may be given by gas detection alarms or low temperature alarms or high-pressure alarms). Also check and record all levels in tanks.
7. As appropriate to type of vessel, check for signs of water penetrating the inter-barrier and insulation spaces. (Indications may be Inter-barrier bilge high level alarms with increased boil off and rising cargo tank pressures).

8. When the following has been ascertained inform bridge as to the structural condition of vessel.
9. Ascertain whether there have been any internal oil spills (bunkers and lub-oils.) or any overside pollution. (Should there be any pollution or the likelihood of pollution, vessel is required to notify the facts to the nearest coastal authorities.

Action to be taken by engine room department

In the machinery spaces a collision if small may not be noticed and the engineers will rely on the bridge to inform them that one has taken place. If however a bump is heard or felt in the machinery space then the bridge is to be informed immediately. The procedures to be followed by the engineers in the event of any collision are as follows.

1. If a bump was felt or heard in the machinery space notify the bridge immediately.
2. If the Alarm is sounded report to your respective muster points.
3. Change the engine room plant over to standby manoeuvring conditions.
4. Carry out an inspection of the machinery spaces and asses any damage particularly with respect to integrity of the hull, oil tanks, water tanks and dry spaces.
5. Damage to any machinery or pipe systems should also be looked for.
6. Sound all tanks and double bottoms and check for losses or ingress of water.
7. Make relevant notes in the E.R. Log book.

Collision with no apparent rupture of cargo (MEMBRANE)

The ability of the vessel, and in particular, the cargo containment system to survive a collision by absorbing the energy of a colliding vessel is dependent on many factors including the colliding ship's size, displacement, speed and angle and point of contact. Independent analysis made by various parties and Classification Societies during the design of LNG vessels have estimated that the most critical are the side-on collision (90° approach of colliding vessel) with a bulbous bow design. If a collision is unavoidable and it is possible to reduce the angle of impact from 90° to a more oblique angle, the survivability of the vessel and the cargo containment system will significantly increase.

Following a collision:

1. If the vessel lists sharply, then it is likely that a ballast tank(s) or other spaces have been breached in the vicinity of the contact and flooding has occurred.
2. Whether the vessel lists or not, all soundings should be checked immediately and the gas detection system closely monitored.
3. If the inner hull has been breached, all available means should be employed to keep the secondary insulation space pumped dry of water to prevent degradation of the insulation material.
4. Regularly monitor the primary insulation space for possible primary membrane leakage. If gas leakage is detected, increase the nitrogen sweep through the primary insulation.
5. Attempts to right the vessel should only be made after advice from the managing office has been received. In critical circumstances, righting of the vessel may be

attempted utilising the information available in the "Damage Stability Booklet" taking care to avoid overstressing of the vessel.

6. Only essential personnel should be allowed on the deck.
7. An urgency signal giving relevant details should be made to the local coastal authority and to any vessels in the area. If the survivability of the vessel is in doubt, then a distress signal should be made.
8. A realistic assessment should be made of the ability of the vessel to remain afloat.
9. If it is determined that the vessel is unlikely to survive, abandonment should be made in good time.
10. When it is certain that the vessel is safe and secure, offers of assistance should be made to any other vessel involved in the casualty.
11. The listing of the vessel may tend to give rise to panic amongst shipboard personnel. To guard against this, it should be explained to all personnel at drills and exercises that LNG vessels have a large reserve buoyancy and that a list resulting from a collision is not necessarily cause for immediate danger.
12. Officers should be aware of the causes of any list and the implication of a list due to asymmetrical buoyancy or weight and of a loll due to a loss of stability.
13. Where necessary Ship to Ship transfer of cargo will be arranged by the managing office. In such cases, procedures referenced in the ICS/OCIMF/SIGTTO publication Ship to Ship Transfer Guide (Liquefied Gases) should be followed.

Collision accident and immediate action

1) Raise general alarm
2) Muster the crew to check if anybody is missing or injured
3) Stop cargo operations. Activated ESDS
4) Sound bilges and tanks
5) Advise the terminal
6) Consider - release loading arms (PERC system)
7) Consider - leave terminal
8) Treat injured crew/personnel
9) Check damage to the vessel and evaluate the situation
10) If necessary, start bilge pumps and ballast pumps
11) Keep the ship upright as far as possible in case of flooding of ballast tanks, by ballasting or de-ballasting to other tanks
12) Consider - external assistance. Rescue operations
13) Evaluate possibility to abandon vessel
14) Establish contact with other vessel, and exchange relevant information
15) Offer your assistance if possible to other vessel
16) Collect all facts about the occurrence
17) Consider - send distress signal including vessel position
18) Evaluate risk of pollution
19) Consider - loss of stability. Determine stability and bending moments/shearing force by the loading calculator
20) Supply inert gas to hold spaces for inerting hold spaces if necessary
21) Start water curtain
22) Consider - discharge cargo to sea (Jettisoning nozzle, advisable to run two cargo pumps)

23) Inform CMSI, Owners, Local Authorities, Insurance/ P&I, Classification Society

Collision - Hitting the Quay

1) Stop main engine at once
2) Try to pull the vessel away from quay by tugboats and ship's main engine
3) Evaluate extent of the damage. Vessel's damage and damage to quay
4) Consider - use anchors in order to hold position and avoid further damage
5) Watch for pollution by oil, try to minimise/ confine
6) Attend any injured people
7) Consider - leaving port due terminal being temporarily out of service
8) Inform CMSI, Owners, Local Authorities, Agent, Insurance/P&I

Reference: http://www.liquefiedgascarrier.com/collision-accident.html

APPENDIX 8B

LNG TERMINALS - CONSENT AND OPERATIONAL ISSUES HEALTH AND SAFETY EXECUTIVE (HSE)

APPENDIX 8B
LNG terminals - Consent and operational issues
Health and Safety Executive (HSE)

Introduction

This document describes the legal framework and the role HSE has in ensuring safety at Liquefied Natural Gas (LNG) terminals in the UK. HSE's primary role and regulatory responsibilities for ensuring safety are during the design, construction, and operation of LNG terminals and ensuring appropriate emergency plans are developed. This document also describes the legal framework and HSE's advisory role in the land use planning system. It also identifies the interfaces between HSE and other regulatory bodies who also have responsibilities associated with LNG terminals.

This document deals with the arrangements for England and Wales where all of the currently proposed LNG import terminals are situated; arrangements for Scotland are similar but different organisations are involved.

Similar arrangements to those described below apply to the transport and storage of other dangerous substances.

Frequently asked questions

What is LNG? Is it dangerous?

LNG is liquefied natural gas. This is the same gas supplied to homes and offices but in a liquid form. The gas is a liquid because it is kept at very low temperature. At ambient temperature, the liquid rapidly expands becoming natural gas.

The liquid itself is not dangerous, however any liquid released into the open, will rapidly turn into large volumes of natural gas, which could if not contained either catch fire or explode.

What assurances can HSE give regarding safety?

The primary responsibility for safety lies with the operator of the LNG Terminal. The operator has to ensure that its site is designed, and constructed, then operated safely.

The principal legislation covering LNG establishments is the Control of Major Accident Hazards Regulations 1999 (COMAH). The Regulations aim to prevent major accidents involving dangerous substances and to limit the consequences of any accident to people and the environment.

The regulations are enforced by the COMAH Competent Authority (CA) comprising HSE and the Environment Agency in England and Wales. HSE is the lead agency for LNG safety.

The safety of the terminals will be assured if the operator complies with all relevant health and safety legislation. Where LNG terminals are properly designed, constructed and operated then the likelihood of failure leading to a major accident is very low.

What measures are put in place to mitigate against the consequences of an on-site incident?

The terminal operator has a duty to prepare and test emergency procedures for dealing with the consequences of a major accident. The Local Authority must prepare an emergency plan which details how an emergency relating to a possible major accident in its area will be dealt with. If you live in the vicinity of the terminal you will have been provided with information on what to do in the event of an incident. The emergency plan should specify how warnings will be given to members of the public who may be affected by an incident or accident.

Who is responsible for ensuring safety at the site?

The primary responsibility for ensuring safety lies with the operator of the LNG site.

HSE's role is to assess the COMAH pre-construction and pre-operation safety reports submitted by the operator and by undertaking regular inspections of the site during its construction. Further inspections will then be carried out at the site throughout its operational life to ensure the operator continues to run the site safely.

The nature of LNG sites means HSE is also required to work closely with other, relevant agencies, including; for example, the Maritime and Coastguard Agency and Hazardous Substances Authorities to ensure a coordinated response whenever necessary.

Who ensures the safety of LNG vessels in transit to, approaching, and moored on the jetty?

HSE advises on those elements within its expertise, i.e. the unloading and land based activity. Where shipping is involved it is for the Hazardous Substances Authority to decide whether or not to consult other, such as the Maritime and Coastguard Agency, in addition to other statutory consultees. The functions, responsibilities and means of co-operation between HSE and Maritime and Coastguard Agency operational activities are set out in a Memorandum of Understanding between HSE and MCA.

What are the Regulations that govern operations at this site?

Major hazards regulation has three main strands:

1. First and foremost major accident prevention at the terminal is achieved through the COMAH Regulations 1999 (as amended 2005) which requires reasonably practicable measures to be in place to prevent fires and explosions from the escape of LNG at the terminal. This is achieved through effective management, process and procedures, and good practice safeguards that are proportionate to the risks. The terminal's COMAH safety reports relates to the actual or anticipated presence of LNG on site and is required to be reviewed at least every five years.

2. A Hazardous Substances Consent is granted by the Hazardous Substances Authority (in this case Pembrokeshire County Council and Pembrokeshire Coast National

Park Authority). A Consent is part of the second layer of public safety protection and is a land use planning (LUP) control under the EU Seveso II Directive. Although very rare, the risk of a major accident with significant off-site consequences cannot be reduced to zero even at a major hazard site which is built and operated to the relevant good practice standards required by COMAH. Consents therefore aim to control the development of new major hazard sites to ensure long-term separation with land in public use and minimise the impact of any major accident on the surrounding community. In some cases, consent conditions can be imposed that require an operator to implement additional processes and technical measures to reduce the risk and/or consequence of a major accident further than that achieved through COMAH.

3. Emergency planning is the third layer and is designed to mitigate the consequences of a major accident through good on and off-site emergency response arrangements.

LNG storage sites and terminals in Great Britain

Apart from a short period in the early 1960s when Canvey Island was used as an import terminal, the 40 year history of LNG in Britain has been of strategic storage (peak shave) and land based transport of LNG to storage facilities supplying remote networks.

At the beginning of 2005 there were five Top Tier LNG storage sites at Glen Mavis, Partington, Avonmouth, Dynevor Arms and Isle of Grain. These were built approximately 30 years ago as peak shave plants to reinforce gas supplies at vulnerable points of the National Transmission System (NTS). During the summer, when demand for gas is low, the sites take gas from the NTS, liquefy it, and put it in storage. They export this gas back to the NTS to meet peak day demand in the winter, typically on 5 days per year.

There are also four Lower Tier storage sites at Wick, Thurso, Oban and Campbeltown. LNG is shipped by road tanker to provide gas for remote networks isolated from the NTS. These Scottish Independent Undertakings (as they are known) are operated by Scotland Gas Networks plc.

During 2005 the conversion of Isle of Grain from a peak shave plant to an import terminal will be completed; and work is going ahead to develop other import terminals to meet the anticipated shortfall of natural gas from the North Sea, Irish Sea and continental interconnectors.

Land Use Planning and Hazardous Substances Consent

All establishments wishing to hold stocks of certain hazardous substances above a threshold quantity must apply to the Hazardous Substances Authority (HSA) - usually the local planning authority - for a hazardous substances consent under the Planning (Hazardous Substances) Regulations 1992[1]. For LNG the threshold is 15 tonnes. HSE is one of eleven organizations that the HSA must consult as to the advisability or otherwise of locating a major hazard establishment in the location designated.

HSE assesses the risks based on the consent particulars and, in some cases, other plant features which significantly affect the risk to people and which may need to become

conditions of consent. HSE advises on health and safety issues within its expertise and which are covered by the Health and Safety at Work Act; any issues about the scope of planning legislation are a matter for the HSA. There is a large body of planning law, planning circulars and legal precedents that affect what the HSA takes into account.

Where consent is granted, HSE will set a consultation zone around the major hazard site and notify the hazardous substance authority. Whenever a development is proposed within the consultation zone HSE is consulted for its advice as to the advisability or otherwise of locating the particular development there.

In England and Wales[2] the hazardous substance authority makes the decisions on planning issues. HSE's role is as a consultee to inform the hazardous substances authority whether there are safety grounds for refusal.

The advice outlined above relates purely to the land use planning process and is not the principal means to achieve safety when the installation starts to operate. That is achieved primarily through the Control of Major Accident Hazard Regulations 1999 (COMAH).

Control of Major Accident Hazard Regulations 1999

The principal legislation covering LNG establishments is the Control of Major Accident Hazards Regulations 1999 (COMAH). Their aim is to prevent major accidents involving dangerous substances and to limit the consequences of any accident to people and the environment. The regulations cover the unloading equipment at the jetty, the site itself, and the outfeed up to the national gas transmission system. Dangerous substances on the ship are not covered by COMAH but are subject to the Dangerous Substances in Harbour Areas Regulations 1987.

The COMAH regulations are enforced jointly in England and Wales by a Competent Authority (CA) comprising the Health & Safety Executive (HSE) and the Environment Agency (EA)3. In the case of LNG establishments HSE is the lead authority.

An operator who plans to build a new LNG establishment has to submit information to the CA in advance of construction in the form of a pre-construction safety report (PCSR). Another, similar, report must be sent to the CA prior before dangerous substances are introduced into the plant - the pre-operations safety report (POSR). The operator has to ensure that the construction and operation of an establishment does not start until he has received from the CA the conclusions of its examination of the relevant report.

The purpose of the PCSR is to ensure that safety is considered fully at the design stage. If things need to be improved or altered then it is easier to make those changes at the design stage than to wait until the site is being built. When the CA assesses a safety report it is looking for a demonstration that adequate safety and reliability have been incorporated into the design, the application of good practice and for concepts which reduce the risks to As Low As is Reasonably Practicable (the ALARP Principle). Operators must, as a minimum, meet recognised good practice and then look at what more can be done to reduce risks without excessive costs.

The POSR must demonstrate that the operator has taken all measures necessary to prevent major accidents and to limit the consequences to people and the environment of any that do occur. If the CA considers that there is evidence of serious deficiency in any of the

measures taken or proposed it will prohibit the operation of those parts of any establishment which are seriously deficient.

As well as assessing the formal safety reports the CA is required to organise an adequate system of inspections while the establishment is operational - this is developed towards the end of the POSR assessment. The CA will also investigate incidents and accidents which occur on site.

Regular inspection visits will be made during the construction phase to ensure that the integrity of the plant and equipment is in accordance with the information provided in the PCSR, including adherence to recognised and accepted standards and good practice. The construction activities on site will also be inspected to check that the operator is doing all that is necessary to ensure the health and safety of those at work.

Under COMAH, operators of LNG terminals are also required to produce an on-site emergency plan before the establishment starts to operate and must provide information to the local authority to assist them in their production of an off-site emergency plan. The plans' objectives are to contain and control incidents to minimise the effects and to limit damage to persons, the environment and property.

Consent and operational issues summary

	Hazardous Substances Consent & Land Use Planning	COMAH - pre-construction, pre-operational and operational phase
Ship in transit to, approaching, and moored on the jetty	HSE advises on those elements within its expertise, i.e. the unloading and land based activity. Where shipping is involved it is for the Hazardous Substances Authority to decide whether or not to consult others, such as the Maritime and Coastguard Agency, in addition to the eleven statutory consultees. The functions, responsibilities and means of co-operation between HSE and the Maritime and Coastguard Agency (MCA) operational activities are set out in a Memorandum of Understanding between HSE and the MCA. Land Use Planning and Hazardous Substances Consent issues are not covered by that document.	LNG on the ship at the jetty is not considered to be part of the inventory of the COMAH establishment but must be taken into account if it could cause or exacerbate a major accident. Safety reports are required to take account of external events which could lead to a major accident at the establishment and an incident on a ship must be taken into account in the safety report to the extent that it could affect the safety of the establishment. Harbours used for the unloading of LNG are managed by statutory harbour authorities which have duties under the Dangerous Substances in Harbour Areas Regulations 1987. Harbour authorities control the marine traffic into and through the harbour, and the berthing and moving of ships. They are bound by the Port Marine Safety Code, compliance of which is monitored by the Maritime and Coastguard Agency (MCA). The functions, responsibilities and means of co-operation between HSE and MCA operational activities are set out in a Memorandum of Understanding between the two bodies.

	Hazardous Substances Consent & Land Use Planning	COMAH - pre-construction, pre-operational and operational phase
Connections between the ship and the jetty and unloading operations	HSE is one of eleven statutory consultees to the local Hazardous Substances Authority under the Planning (Hazardous Substances) Regulations 1992. HSE advises on those elements within its expertise, which includes the unloading and land based activity.	The safety reports should include an assessment of the integrity of the LNG off-loading arrangements between the ship and the establishment. These arrangements should, as a minimum, be designed in accordance with BS EN 1523:1997 "Installation and equipment for liquefied natural gas - Ship to shore interface". Note: Under the Dangerous Substances in Harbours Regulations 1987, HSE enforces the safety precautions which must be taken during the unloading of dangerous substances within the harbour area.
Pipelines between jetty and storage	Pipelines which are within the area notified under the hazardous substances consent, are included within the hazardous substances consent consideration. Pipelines outside this area have to be notified to HSE under The Pipelines Safety Regulation 1996. When HSE is notified it advises the local authorities of appropriate land use planning controls along the route of the pipeline on the basis of the information supplied with the notification.	The safety reports should include an assessment of the integrity of the LNG pipelines within the COMAH establishment. These are designed and installed to recognised standards such as ASME B31.3 - Process Piping, a chemical plant and petroleum refinery piping code. The design takes into account of the low temperature service of the pipelines.
Storage tanks	Storage tanks are a significant consideration in the advice HSE provides as a statutory consultee under the Planning (Hazardous Substances) Regulations 1992.	The safety report should consider the effect of foreseeable hazards such as extreme weather, aircraft impact, earthquakes, etc. on the storage tanks and any release that may result. However, the assessment is restricted to

	Hazardous Substances Consent & Land Use Planning	COMAH - pre-construction, pre-operational and operational phase
		foreseeable accidental impact - not to terrorist activity. (see below) The site survey should investigate the geological characteristics of the region in sufficient detail to provide a clear understanding of the physical processes that formed the area, as well as the potential for the future seismic activity. The size of the region to be investigated depends on the nature of the area around the site and is generally limited to a distance of 320 km from the site.
Regasification plant and compression	HSE is one of eleven statutory consultees to the local Hazardous Substances Authority under the Planning (Hazardous Substances) Regulations 1992. HSE advises on those elements within its expertise, i.e. the unloading and land based activity. Regasification and compression plant are covered by the advice HSE provides.	Once the establishment is in operation, the CA will draw up an intervention plan and have a schedule of inspections to confirm that operations take place in accordance with the COMAH safety report and health and safety law.
Export pipeline	When HSE is notified under The Pipelines Safety Regulations 1996, it advises the local authorities of appropriate land use planning controls along the route of the pipeline on the basis of the information supplied with the notification.	Under The Pipelines Safety Regulations 1996, the pipeline operator must notify HSE of any new pipeline which is to be constructed to allow the gas from a new establishment to be connected with the National Gas Transmission System. HSE will assess the pipeline design, and inspect the construction and +operation of the pipeline.

	Hazardous Substances Consent & Land Use Planning	COMAH - pre-construction, pre-operational and operational phase
Effect on other sites - "Domino effect"	This is not dealt with as part of the consent process but is covered by provisions of the COMAH regulations.	Regulation 16 of the COMAH Regulations requires the Competent Authority to use information provided in notifications and safety reports to designate groups of establishments where the likelihood or consequences of a major accident may be increased because of the location and proximity of establishments in the group and the dangerous substances present there. These are commonly referred to as "domino sites". The Competent Authority will notify the operators of establishments in such groups of the names and addresses of the other operators in the group who are then obliged to exchange appropriate information about their establishments. The operators must take account of this information in their major accident prevention policy documents, safety reports and emergency plans. If it is decided that this Regulation applies to an LNG terminal, the operator will be duly notified and advised of the need to take account of potential incidents in neighbouring establishments in the risk assessment for the LNG establishment.

	Hazardous Substances Consent & Land Use Planning	COMAH - pre-construction, pre-operational and operational phase
Terrorist activity	The Hazardous Substances Authority is advised by the security services and Home Office on terrorist issues.	The safety reports should consider the risks arising from trespass of an ordinary member of the public. Terrorist issues are a matter for the security services and the Home Office.
Emergency planning	This is not dealt with as part of the consent process but is covered by provisions of the COMAH regulations.	Operators of LNG terminals are required to produce an on-site emergency plan before the establishment starts to operate and must provide information to the local authority to assist them in their production of an off-site emergency plan. The plans' objectives are to contain and control incidents to minimise the effects and to limit damage to persons, the environment and property. In harbours subject to the Dangerous Substances in Harbour Areas Regulations 1987 the harbour authority must develop an emergency plan for dealing with incidents involving dangerous substances. Harbour Authorities should liaise with people producing on-site and off-site emergency plans for COMAH sites so that the plans are compatible in the event of a major emergency affecting both the site and the harbour or harbour area.

Footnotes

[1] In addition to applying for hazardous substances consent a separate planning application must also be made to the local planning authority. HSE has no role in such planning applications (unless they fall in the consultation zone of another site) and this document does not address this.

[2] In Scotland the planning authority has the role of the hazardous substance authority 3 In Scotland the CA comprises HSE and the Scottish Environmental Protection Agency

Reference

http://www.hse.gov.uk/gas/supply/ingterminals.htm access on May 2016

APPENDIX 8C

DETAIL OF FIRE FIGHTING SYSTEM FOR THE PROJECT

APPENDIX 8C
DETAIL OF FIRE FIGHTING SYSTEM FOR THE PROJECT

1. The Fire Water Loop

Terminal fire water loop facilities shall be independent, but with service water provided by the existing Power Plant to a dedicated Service/Fire Water Tank.

The distribution main loop system shall be split into independent sections equipped with isolation valves in order to allow water supply from two directions. The plant shall be segregated in separate blocks, and for each event, water will be applied in the affected and surrounding blocks to avoid escalation of an incident.

As prescribed in NFPA 59A, the design fire water flow rate, is equal to the one requested to fight a fire resulting from the most severe incident in one area of the plant increased by an allowance of 63 l/s for hydrants (1 000 gpm).

The system has two water sources (the service water tank (sized for minimum 2 hours autonomy) and the sea) and three pump sets:

- The fire water jockey pumps maintains the pressure of the fire water distribution network normally filled with service water.
- The auxiliary fire water pump (designed for maximum demand scenario) fed from the service water tank supply service water for fires (short action) and for filling and testing periodically the water deluge systems.
- The seawater firewater (electric and diesel driven) pumps (each designed for maximum demand scenario) used for extreme incidents and as backup to pumps, which are located on the Jetty Structure

The maximum firewater demand generally originates from one of the following three main fire scenarios (to be confirmed following QRA):

- Vaporizer Process Area
- Jetty Head Area

The fire water pumps and drivers shall comply with NFPA 20 requirements.

The auxiliary fire water pump is located in the general facilities area near the service water tank designed to supply fire water for a period of not less than two hours. The sea water pumps shall be located on the trestle, providing direct access to the sea, providing the primary source of firewater. After the network has been used with sea water, it needs to be flushed with service water to eliminate any risk of corrosion

The fire water loop feeds the fire water hydrants (outdoors and indoors), the fire water spraying systems, the water monitors and the foam packages.

Pre-orientated self-oscillating monitors and supplementary hydrant connections are provided around the main rack, LNG Storage, LNG Booster pumps and Vaporiser areas to protect in case of fire one part from the other.

Inside the buildings wall hydrants will be provided as per the requirements of the Local regulations.

The hydrants will be installed as per the requirements of the Local regulations.

The flexible hoses and accessories will be installed in cabinets, with minimum 1 cabinet for 2 hydrants.

2. Firefighting facilities at the jetty

On the jetty head, the fire water header shall feed: □ A fire water distribution □ 2 remote operated water monitors

- Fixed spraying system on arms, Jetty KO Drum, gangway and LNG manifold and Jetty Monitoring Building
- Oscillating Monitors and hydrants
- An international standard connection (SOLAS connection) for link with the FSU.

Tug boat with monitor should be available for backup.

The fire fighting on the jetty will also include (to be confirmed by EPC CONTRACTOR):

- the jetty foam system
- the 500 kg dry-chemical powder skid

3. The water spraying systems

The water spraying systems are provided for exposure protection.

Protected locations are:

- LNG Intermediate storage,
- Unloading arms, manifolds and risers, Jetty Monitoring Building, jetty KO drum and piping on the jetty head,
- The gangway and remote oscillating monitors and hydrants,
- LNG Booster Pumps and Compressor shelter (to be confirmed after QRA),
- Process substation,
- Transformers,
- etc.

The water spraying systems are manually actuated from the control room or locally and are designed following NFPA 15 recommendations.

4. The foam systems

High expansion foam systems are used to reduce heat radiation from LNG pool fire and aid safer gas dispersion in the event the leak does not ignite.

Each of the foam system provided includes:

- The foam generator;
- The pressurized emulsifier drum and injection system;
- The fire water quick connection.

Foam generators will be located:

- On the jetty platform,
- At each impounding basin (shoreline and tank area).

A foam retention device (as fence) shall be placed around impounding basins where there is a risk of foam loss due to wind.

Foam tanks shall be located in a place sheltered from heat radiation (from fire and solar).

5. Portable/mobile fire extinguishers

The following types of extinguishers are foreseen:

- Foam type extinguishers in area where oil may be present (hydraulic unit of unloading arms and gangway at the jetty, lube oil for compressors, diesel oil).
- Carbon dioxide type extinguishers for electrical and instrumentation applications.
- Dry chemical powder extinguishers in process areas.

The fire extinguishers comply with the requirements of the local and national regulations.

Indoor dry chemical fire extinguishers shall be provided in the gas analyzer building and in the Captive Power Plant building.

The outdoors dry chemical fire extinguishers may be of 10 kg and 50 kg capacities.

These extinguishers are installed in the critical locations along the circulation paths and/or platforms.

Their position shall be along an escape route from the identified hazard they are installed to mitigate.

6. Fire Fighting Vehicles

A firefighting truck for first intervention, equipped with dry chemical and foam tanks, should be provided and located permanently on site to fight an anticipated fire.

This truck is fitted with:

- 3 m^3 emulsifiant for H.E foam generation,
- 2 tanks of 500 kg chemical powder,
- First intervention tools.

An emergency pick-up with foam and dry chemical extinguisher should be used for small interventions. This pick-up should be provided with :

- First intervention tools,
- 1 portable foam generator,
- 2 x 50 kg dry chemical powder extinguishers.

Firefighting facilities, vehicles, system and personnel requirements to be confirmed by OWNER following his consideration of integration with existing CCPP firefighting practices and teams.

7. Dry Chemical Powder

500 kg skid mounted units shall be provided at:

- Jetty head
- Onshore impounding basin

50 kg mobile units shall be provided as detailed in the Fire Protection Layout drawings.

All skids shall be provided with flexible hoses.

Actual number and capacity of dry chemical powder skids to be confirmed by EPC CONTRACTOR after QRA.

The requirement for additional dry chemical powder skids close to other facilities such as HP pumps, STV, BOG Compressors shall be confirmed by EPC CONTRACTOR after QRA.

8. Clean Agent Extinguishing System

Upon detection in the switchroom, a substation or cable cellar a clean agent extinguishing system such as "Inergen" will release the inerting gas for fire protection.

9. Protection in Manned Buildings

Manned buildings shall be provided with sprinkler systems as per NFPA and Philippine National standards.

APPENDIX 9A

PRELIMINARY ENVIRONMENTAL AND SOCIAL COST ESTIMATION

APPENDIX 9A
PRELIMINARY ENVIRONMENTAL AND SOCIAL COST ESTIMATION

A. Total Budget during 15 Months of Pre-construction and Construction Phases

No.	Cost Items	Unit Cost		Frequency	Sampling Station	Total Cost (USD)
		US$	Units			
1	Environmental monitoring during the pre- construction/ construction period (15 months)					
	air quality (2 stations)	800	Station	1 time/three months (5 time during pre-construction/construction Phase)	2 stations at project site and Nga Pitat Village	8,000
	noise measurement (3 stations)	700	Station	1 time/three months (5 time during pre-construction/construction Phase)	2 stations at project site and Nga Pitat Village	4,200
	coastal water measurement (10 stations)	500	Station	1 time/ months (15 time during pre-construction/construction Phase)	10 stations at proposed approach channel and 5 km radius	75,000
	marine ecology measurement (10 stations)	1,000	Station	1 time/ months (15 time during pre-construction/construction Phase)	10 stations at proposed approach channel and 5 km radius	150,000
	wastewater measurement (1 station)	600	Station	1 time/ months (15 time during pre-construction/construction Phase)	1 stations at discharge point	9,000
	traffic flows measurement (1 stations)	500	Station	2 times during construction	1 station at project at Nga Pitat Village	1,000
	navigation flows measurement (2 stations)	500	Station	2 times during construction	2 station at access channel and river mouth of Britney Creek	2,000
	flora and fauna field survey	6,000	Lumpsum	1 time before site clearance	124 acre of proposed project site	6,000
	waste and hazardous waste management	-	Include Construction Cost	Every day	Cosntruction Site and Surrounding Area	a
2	OHS Management Plan	-	Include Construction Cost	Every day	Cosntruction Site and Surrounding Area	a
3	Social development and livelihood support for PAPs					
3.1	for resource management					
	Development at new alternative fishing ground and boat yard area	300,000	Lumpsum	Every day	at new alternative fishing ground and boat yard area	300,000
	Attitude survey at Nga Pitat Village about new fishing ground and boat yard area			1 time per three months	Nga Pitat Village	include on cost of resource management
	Attitude survey at three affected village			1 time per three months	Nga Pitat , Mudu, and Nyau Biensiek	include on cost of resource management
	and Public Consultation			1 time per three months	Nga Pitat , Mudu, and Nyau Biensiek	include on cost of resource management
3.2	For moving of shrine	15,000	Lumpsum	2 time before, during, and after moving shrine	at the new shrine area	15,000
4	Emergency Management Plan	-	Include Construction Cost	2 times	Construction Site	a
	TOTAL					**570,200**
	CONTINGENCY (APPROX. 10%)					**57,020**
	GRAND TOTAL					**627,220**

Remark : a = include on construction cost prepared by sub-contractor

B. Total Budget during Operation Phase (75 years, 50 years operation plus 25 years extensions)

No.	Cost Items	Unit Cost		Frequency	Sampling Station	Budget during Operation Phase (USD)	
		USD	Units			From year 1 to year 5 of operaiton (total 5 years)	From year 6 and throughout operation (total 70 years)
1	Environmental monitoring during the operation period						
	Coastal water measurement (10 stations)	500	Station	twice a year throughout operation phase during dredging activities and after complete maintenance	10 stations at proposed approach channel and 5 km radius	50,000	700,000
	Marine ecology measurement (10 stations)	1,000	Station	twice a year throughout operation phase during dredging activities and after complete maintenance	10 stations at proposed approach channel and 5 km radius	100,000	1,400,000
	Navigation flows measurement (1 stations)	500	Station	once a year throughout operation phase	1 station at river mouth of Britney Creek	2,500	35,000
	Mangrove reforestation, rehabilitation, and maintenance (10 years)	350,000	Lumpsump	during 1st-10th year of operation phase	at reforestation area	175,000	175,000
	Support local villagers in rehabilitation activities (10 years)	1,000	time	during 1st-10th year of operation phase	at reforestation area	5,000	5,000
	Shoreline Erosion	750,000	Lumpsump	Monthly	5 km of south and 5 km of north breakwater	50,000	700,000
	Beach Profile	10,000	Lumpsump	twice a year throughtout operation phase	beach in front of project site and 5 km of south and 5 km of north breakwater	100,000	1,400,000
2	OHS Management Plan	-	Include Operation Cost	Everyday	Project Site	b	b
3	Roll-Over Prevention	-	Include Operation Cost	Everyday	Project Site (Onshore and Offshore)	b	b
4	Static Electric Sparking	-	Include Operation Cost	Monthly	Project Site (Onshore and Offshore)	b	b
5	Rapid Phase Transition	-	Include Operation Cost	Everyday	Project Site (Offshore)	b	b
6	Emergency Plan	-	Include Operation Cost	Everyday	Project Site (Onshore and Offshore)	b	b
7	Operation Staff	-	Include Operation Cost	Everyday	Project Site	b	b
8	Social development and livelihood support for PAPs						
8.1	Development Fund during 1st-5th year	2,000	time	During 1st-5th of operation phase	at three affected village (Nga Pitat, Mudu, and Nyau Binseik)	10,000	-
8.2	Development Fund during 6th to throughout opeartion phase	1,000	time	During 6th-throughout operation phase	at three affected village (Nga Pitat, Mudu, and Nyau Binseik)	-	70,000
8.3	Village forum	150,000	Lumpsum	2 times per year during 1st-5th of operation phase and once a year throughout operation	at three affected village (Nga Pitat, Mudu, and Nyau Binseik)	30,000	120,000
	TOTAL					522,500	4,605,000
	CONTINGENCY (APPROX. 10%)					52,250	460,500
	GRAND TOTAL					**574,750**	**5,065,500**
							5,640,250

Remark : b = include operation cost prepared by project proponent