PTTEP

Monitoring Report of Exploration Drilling Campaign in Block MD-7

REM-UAE
LABORATORY AND CONSULTANT COMPANY LIMITED
B702 Delta Plaza, Shwegondaing Rd., Bahan, 11201 Yangon, Myanmar.
Tel: (959) 73013448; (959) 5144005; (959) 5376382

REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENTAL CONSERVATION
ENVIRONMENTAL CONSERVATION DEPARTMENT

SUBMISSION FORM OF MONITORING REPORT

This is the official submission form of Monitoring Report under *Environmental Impact Assessment Procedure Notification No.616/2015*. This form shall be completed in its entirety and submitted to the Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation, along with all required Monitoring Report according to the issued Environmental Compliance Certificate (ECC).

Project Proponent Information

Proponent Name:	**PTTEP South Asia Limited**	Company Registration Number by DICA (if any):	**84 FC**
Contact name of Proponent:	**Hsu Myat Maw**		
Proponent's address for correspondence:	**Vantage Tower, 623 Pyay Road, Kamayut Township, Yangon, Republic of the Union of Myanmar**		
Telephone (fixed/mobile):	**09784443327** Fax: **01 661814**	Email address:	hsumyatm@pttep.com

Project Information

Project Title	**EIA Study of Exploration and Drilling Campaign n Block MD-7**
Project Location (Address)	**Deep Water Block MD-7, Gulf of Martaban, Andaman Sea**
ECC number	

Status of Compliance to ECC conditions

This provides an overview of the project's compliance with the conditions set in the ECC. It shall be summarized in the following table;

No. of ECC conditions	Status of compliance	Remarks

Compliance to the Environmental Management Plan (EMP)

This provides an overview of the compliance to the EMP committed by the proponent during the review of the ECC application. It shall be summarized as in the following Table;

Proposed mitigation measures	Cost	Institutional Plan	Schedule	Guarantees	Remarks

Validation of Project scale and predicted impact

In case of any change of the project scale or parameters of the predicted impacts, the proponent shall provide the status of the changes as in the following table. If the changes are significant, the Ministry may request additional survey to the proponent as to update the issued ECC.

Items (scale, predicted impact)	Scale / Parameters at the survey phase	Actual scale / parameters	Remark

Signature (Representative of the project proponent)

I, the undersigned Proponent (or representative, there of), hereby state that the information provided in/with the application and the report ensure that the Monitoring Report are undertaken in a professional manner and in accordance with EIA Procedure Notification No. 616/2015 and any applicable legislations issued or adopted by the Ministry.

Signature: 

Date of submission: (dd/mm/yyyy)

Print name: Hsu Myat Maw

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Date received: Project Identification Number:

The proponent submitted the reports with the forms of; ☐ Paper copy ☐ Digital copy

Recorded by:

Additional comments, notes or recommendations (attached if necessary):

Table of Content

List of Table

List of Table (cont.)

List of Figure

List of Figure

Page

Appendix

Executive Summary

REM-UAE Laboratory and Consultant Company Limited conducted compliance audit of implementation of environmental mitigation measures and monitoring program for Exploration Drilling Campaign in Block MD-7.

The objective of the review was to evaluate the effectiveness of implementation of the Environmental Management Plan, including both mitigation and monitoring measures, defined in the EIA report. Reporting of observed problems, obstacles and recommendations for issued identified during the review were provided in order to improve the effectiveness of the existing environmental mitigation and monitoring measures.

The evaluation process includes (1) meeting with PTTEP SA personnel, (2) site observation and interview with PTTEP SA's representatives, and (3) document review.

1. Project Description

Block MD-7 is a deepwater block located in the Gulf of Moattama in the Andaman Sea, offshore Myanmar. The total area of Block MD-7 is 7,798 km^2. The water depth of Block MD-7 ranges from approximately 700 – 3,000 m. The proposed exploration well (Well-1 or Project Site or Project Area) is located within the upper northeast section of Block MD-7. The project site is 660 km south of Yangon, 425 km southwest of Dawei, 330 km southwest of Myeik and 280 km northeast of Kawthoung, Myanmar. Water depth at the proposed well location is 2,310 m.

PTTEP South Asia Limited (PTTEP SA) has been granted the Production Sharing Contract (PSC) for offshore Block MD-7, owned by Myanma Oil & Gas Enterprise (MOGE). PTTEP SA is the Operator of the Production Sharing Contract (PSC) for Block MD-7.

2. Logistics and Utilities

1) Transportaion

Supply vessels will transport catering provisions, supplies, casing/tubing, fuel, drilling water, fresh water, mud and cementing materials to the drilling rig. Crews will be transported by crew boat and/or helicopter. Heliports are located in Yangon and Kawthaung, Myanmar. PTTEP SA will use its Thaketa Supply Base (TKA) in Yangon and Ranong Supply Base (RSB) in the port of Ranong Province (Thailand) as logistic bases.

2) Energy Use

The primary energy source for the Project is diesel. Diesel will be used as fuel to power the various vessels, equipment, generators and the Drilling Rig. The result of estimation of total fuel (Diesel) use on vessels and the drilling rig during drilling phase is 1,200 m^3.

3) Water Use

The Project's activities will utilize fresh water for various purposes such as domestic use, drinking, and operational uses such as deck washing and water required during the drilling operation (to be used as makeup water for the drilling mud and cement mixing).

Potable fresh water will be produced on-board the drilling rig for consumption and domestic use. During drilling phase, The Project is estimated to use a total amount of 1,840 m^3 of potable water and 560 m^3 of industrial grade fresh water.

4) Onshore Activities and Support Base

PTTEP SA will use its Thaketa Supply Base (TKA) in Yangon, Myanmar and the Ranong Supply Base (RSB) in the port of Ranong Province, Thailand as logistic bases. Supply vessels will transport catering provisions, supplies, casing/tubing, fuel, drilling water, fresh water, mud and cementing materials to the drilling rig.

3. Emissions, Discharges and Waste Management

1) Waste Management

PTTEP SA will adopt the PTTEP Myanmar Asset Waste Management Procedure (Document Code: 11027-PDR-SSHE-503/01-R02) as the main procedure for waste management of this MD-7 Exploration Drilling campaign. From this drilling campaign, total 16.1 ton non-hazardous waste and 4.473 ton hazardous waste were sent back to shore for final disposal.

2) Air Emission and Greenhouse Gases

From the results of emissions calculations expected that the Project will generate 6,095.32 tons CO_2 (equivalent). Compared to Myanmar's CO_2 release of 201,500,000 tons CO_2e in 20131, the total GHG releases from this project are not significant (approximately 0.0030%), and therefore will not significantly impact the environment.

3) Wastewater

The Project is estimated to generate a total volume of 2,120 m^3 (average 38.5 m^3/day) grey-water and 530 m^3 (average 9.63 m^3/day) sewage. The management system for sewage and grey water will conform with MARPOL 73/78 Annex IV Prevention of Pollution by Sewage from Ships which has to be discharged at a distance of more than 12 nautical miles (22.2 km) from the nearest land.

4. Project's Environmental, Social and Health Policies

PTTEP SA management is fully committed to providing a safe, secured and healthy workplace and conducting its operations in a manner that protects the environment. These commitments are in accordance with PTTEP's Corporate Vision, Mission, and Values and PTTEP' s SSHE Policy. Proactive individual involvement, responsibility and accountability are expected of all employees, contractors and third-party personnel. PTTEP SA SSHE Management System (SSHE MS) is designed to align all stakeholders' efforts to enable attainment of these principles.

All levels of line management at PTTEP SA and contractors are responsible for implementing and maintaining its SSHE policy and SSHE MS. Documents are reviewed and revised at regular intervals for proper implementation.

5. Compliance Status

5.1 Environmental Mitigation Measures Compliance Result in Drilling Phase

The results determined that the project completely complied on the environmental mitigation measures implementation compliance in Drilling Phase with 100% follows the Mitigation Measures.

PTTEP SA complied with all the mitigation measures prescribed in the EIA. Main issues are summarized below.

- **Air Quality -** Routine inspection and preventive maintenance for all machinery were conducted as follows routine PM and Inspection Plan which the project used the SAP system to support PM plan.
- **Seawater and Sediment Quality** - WBM and SBM was used by technical reason. The mud circulation system was provided to circulate mud for recycling. Chemical used and discharge of cutting were recorded by the project and discharged at 15 m below sea surface and SDS were provided. Waste containers were provided at NCB Rig and supply vessel. The waste from NCB Rig and vessel was transferred to dispose onshore by authorized contractor. PTTEP SA followed the requirements of MARPOL 73/78 and PTTEP SA's Waste Management Procedure.
- **Seabed characteristics, Marine Life and Marine Ecology –** PTTEP SA strictly implement and follow mitigation measures for impacts to seawater & sediment quality.
- **Fishing Community / Fisheries** - The project information and drilling plan was already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties 30 days in advance. The project has established 500 m safety zone around the drilling rig.
- **Shipping / Navigation** – The project information and drilling plan was already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties 30 days in advance. The project has established 500 m safety zone around the drilling rig and provided support vessels for warning off traffic and observe fishing and commercial vessels approaching the safety zone to prevent collision. In addition, appropriate lights and warning signals were provided around the NCB Rig and support vessels.

5.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

The results determined that the project completely complied on the environmental mitigation measures implementation compliance in unplanned event with 100%.

- **Vessel Collision** - PTTEP's SSHE Management System was already prepared and enforced all worker and contractor to strictly implement. The information and drilling plan were already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties over 30 days in advance and 500 m safety zone around the drilling rig was established.
- **Accidental Spills** - PTTEP's SSHE Management System were already prepared and enforced the worker and contractor to implement. The project also enforced the worker and contractor to follow all PTTEP's Plan and standard.
- **Well Blowout** - PTTEP's SSHE Management System were already prepared and enforced the worker and contractor to implement. The project also enforced the worker and contractor to follow all PTTEP's Plan and standard.
- **Fire or Explosion** - The project has provided fire protection equipment and manual and lifesaving equipment within project area. Moreover, the project has provided Emergency and Crisis Management Plan and held emergency response drills and exercise. However, there was no emergency situations during drilling activity.

5.3 Environmental Monitoring Result

The project has completely complied the environmental impact monitoring as specified in EIA, including Mud, Cutting and Stock Barite Monitoring and Seawage.

1) Mud, Cutting and Stock Barite Monitoring

- **Chloride in Mud and Cuttings**

  Mud and Cuttings were collected by project staff in February, 2020 in drilling phase. Both result of Chloride (for WBM) is 0.34 % w/w.

- **Oil on Cuttings (for SBM)**

  Cuttings sample were collected by project staff in February, 2020 in drilling phase. The results found that %OOC (dry weight) was 6.20 %. And complied with the standard.

- **Total Mercury and Total Cadmium in Stock Barite**

  Stock Barite was collected by project staff in February, 2020 in drilling phase The results found that total Mercury (in stock barite) is 0.453 mg/kg (dry weight) and total Cadmium (in stock Barite) is ND and those are complied with the standard.

2) Sewage Monitoring

Sewage monitoring was conducted on December 11, 2019 from sewage treatment system discharge point at rig. The result found that when compared sewage monitoring results with Resolution of the Marine Environment Protection Committee MEPC.159 (55) found that BOD and pH were complied with MEPC.159 except Thermo tolerant Coliform Bacteria (FCB) and COD. However, the performance of sewage treatment system has to be considered and improved to ensure that all parameters will meet the control limit as per Sewage Pollution Prevention Certificate.

3) Hazardous and Non-hazardous Waste Monitoring

Hazardous and Non-hazardous Waste monitoring was conducted for drilling phase were done by PTTEP SA. The total amount of Hazardous Waste during drilling phase is 4.473 ton while the total amount of Non-hazardous Waste is 16.1 ton.

4) Occupational Health Management Monitoring

PTTEP SA provided SSHE Management System Manual and training program on Safety, Security Health and Environment Management System (SSHE-MS) and other concerned safety standards have been provided to the contractor for follow with the PTTEP SA's plan. Public and Occupational health and safety monitoring was conducted by recording the accident during working time; including causes, accident level, and performed mitigation measures. Monitoring program and report were conducted throughout operation period following the specified measures in EIA report. There was first aid case (FAC) incident but there was no spillage or leakage occurred during drilling activities. Corrective actions were proposed/implemented to prevent reoccurrence of the incident case.

အစီရင်ခံစာအကျဉ်းချုပ်

REM-UAE ဓာတ်ခွဲခန်းနှင့်အကြံပေးကုမ္ပဏီလိမိတက်သည် လုပ်ကွက်အမှတ် MD-7 တွင် ရှာဖွေတွင်းတူးဖော်ခြင်း စီမံကိန်းအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုလျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်း အစီအစဉ်အား အကောင်အထည်ဖော်ဆောင်ရွက်ရာ၌ လိုက်နာဆောင်ရွက်မှု အခြေအနေကို စစ်ဆေးခြင်းပြုလုပ်ခဲ့ပါသည်။

အကဲဖြတ်ခြင်း၏ ရည်ရွယ်ချက်မှာ EIA အစီအရင်ခံစာတွင် ဖော်ပြထားသည့်အတိုင်း ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှု လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်းအစီအစဉ်၏ ထိရောက်မှုကို အကဲဖြတ်ဆန်းစစ်ရန် ဖြစ်ပါသည်။ အကဲဖြတ်ခြင်းပြုလုပ်စဉ်အတွင်းတွင် တွေ့ရှိရသောပြဿနာများ၊ အတားအဆီးများနှင့် အကြံပြုချက်များဆိုင်ရာ အစီရင်ခံစာကို လက်ရှိပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုလျော့ပါးရေးနှင့် စောင့်ကြည့်စစ်ဆေးခြင်းအစီအမံများ ပိုမိုတိုးတက်ကောင်းမွန်စေရန် ထောက်ပံ့ပေးခဲ့ပါသည်။

အကဲဖြတ်ခြင်းဖြစ်စဉ်တွင် (၁) PTTEP SA မှ တာဝန်ရှိသူများနှင့် တွေ့ဆုံခြင်း၊ (၂) လုပ်ငန်းနေရာသို့သွားရောက်လေ့လာခြင်း နှင့် PTTEP SA ၏ကိုယ်စားလှယ်များနှင့်တွေ့ဆုံမေးမြန်းခြင်း၊ နှင့် (၃) စာရွက်စာတမ်းအကဲဖြတ်စစ်ဆေးခြင်းတို့ ပါဝင်ပါသည်။

၁။ စီမံကိန်းအကြောင်းအရာဖော်ပြချက်

MD-7 လုပ်ကွက် သည် ကပ္ပလီပင်လယ်ပြင် မုတ္တမပင်လယ်ကွေ့ရှိ ပင်လယ်ရေနက်ပိုင်းတွင် တည်ရှိသော လုပ်ကွက်တစ်ခုဖြစ်ပါသည်။ MD-7 ၏ စုစုပေါင်းဧရိယာအကျယ်အဝန်းသည် ၇၇၉၈ စတုရန်းကီလိုမီတာဖြစ်ပါသည်။ MD-7 လုပ်ကွက်၏ ရေအနက်မှာ ၇၀၀ မှ ၃၀၀၀ မီတာ အကြားခန့်ထိတွင် ရှိပါသည်။ အဆိုပြု ရှာဖွေရေးတွင်း (ရေနံတွင်း - ၁ (သို့မဟုတ်) စီမံကိန်းနေရာ (သို့မဟုတ်) စီမံကိန်းဧရိယာ) သည် MD-7 လုပ်ကွက်၏ အရှေ့မြောက် အစွန်းပိုင်းတွင် တည်ရှိပါသည်။ စီမံကိန်းဧရိယာသည် ရန်ကုန်မြို့၏ တောင်ဘက် ၆၆၀ ကီလိုမီတာ၊ ထားဝယ်မြို့၏ အနောက်တောင်ဘက် ၄၂၅ ကီလိုမီတာ၊ မြိတ်မြို့၏ အနောက်တောင်ဘက် ၃၃၀ ကီလိုမီတာ နှင့် ကော့သောင်းမြို့၏ အရှေ့မြောက်ဘက် ၂၈၀ ကီလိုမီတာ အကွာတွင် တည်ရှိပါသည်။ အဆိုပြုတွင်းနေရာရှိ ရေအနက်မှာ ၂၃၁၀ မီတာဖြစ်ပါသည်။

PTTEP South Asia Limited (PTTEP SA) အား မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း (MOGE) မှပိုင်ဆိုင်သော ကမ်းလွန်ရေနံလုပ်ကွက် MD-7 အတွက် ထုတ်လုပ်မှုအပေါ်မှဝေခံစားခြင်းစာချုပ် (PSC) ကို ချုပ်ဆိုခဲ့ပါသည်။ PTTEP SA သည် ထုတ်လုပ်မှုအပေါ်မှုဝေခံစားခြင်းစာချုပ် (PSC) ကမ်းလွန်ရေနံလုပ်ကွက် MD-7 ၏ လုပ်ငန်းဆောင်ရွက်သည့် (Operator) ဖြစ်ပါသည်။

၂။ ထောက်ပံ့ပို့ဆောင်ရေး နှင့် ဝန်ဆောင်မှုနေရာများ

(၁) သယ်ယူပို့ဆောင်ရေး

ထောက်ပံ့ရေးရေယာဉ်များသည် အစားအသောက်နှင့်သက်ဆိုင်သောပစ္စည်းများ၊ ထောက်ပံ့ရေးပစ္စည်းများ၊ ကော့စင်းများ/ပြွန်များ (casing/tubing)၊ တွင်းတူးရာတွင်အသုံးပြုသော ရေနှင့်သုံးရေများ တွင်းတူးရွံ့နှင့် ဘိလပ်မြေဆိုင်ရာ ပစ္စည်းများကို တွင်းတူးစင်သို့ ပို့ဆောင်ပေးပါမည်။ အမှုထမ်းများကို ရေယာဉ် နှင့်/သို့မဟုတ် ရဟတ်ယာဉ်ဖြင့် ပို့ဆောင်ပါမည်။ မြန်မာနိုင်ငံ၏ ရန်ကုန်နှင့် ကော့သောင်းလေဆိပ်တို့ကို ရဟတ်ယာဉ် ရပ်နားပို့ဆောင်ရာ

တွင်သုံးပါသည်။ PTTEP SA သည် ၎င်း၏ ရန်ကုန်ရှိ သာကေတကမ်းခြေအခြေစိုက်စခန်း (TKA) နှင့် ထိုင်းနိုင်ငံ၊ ရနောင်းရှိ ရနောင်းကမ်းခြေအခြေစိုက်စခန်းတို့ကို ထောက်ပံ့ပို့ဆောင်ရေးစခန်းများအဖြစ် အသုံးပြုပါမည်။

(၂) စွမ်းအင်အသုံးချမှု

စီမံကိန်းအတွက်အဓိကစွမ်းအင်အရင်းအမြစ်မှာ ဒီဇယ်ဖြစ်သည်။ အမျိုးမျိုးသောရေယာဉ်များ၊ စက်ပစ္စည်းများ၊ မီးစက်များနှင့် တွင်းတူးစင်တို့ကို စွမ်းအင်ပေးရန်လောင်စာအဖြစ် ဒီဇယ်ကိုအသုံးပြုပါမည်။ ရေနံတွင်း တူးဖော်စဉ် ကာလအတွင်း ရေယာဉ်များနှင့် တွင်းတူးစင်တို့တွင် အသုံးပြုသော စုစုပေါင်းလောင်စာ (ဒီဇယ်) ခန့်မှန်း တွက်ချက်မှုရလဒ်မှာ ၁,၂၀၀ ကုဗမီတာ ဖြစ်သည်။

(၃) ရေအသုံးချမှု

စီမံကိန်း၏လှုပ်ရှားမှုများတွင်ရေချိုကို တစ်ကိုယ်ရေသုံးကိစ္စများအတွက်အသုံးပြုခြင်း၊ သောက်သုံးခြင်းနှင့် ကုန်းပတ်ဆေးခြင်းကဲ့သို့သော လုပ်ငန်းလည်ပတ်မှုဆိုင်ရာ အသုံးချမှုများအတွက်အသုံးပြုခြင်းနှင့် တွင်းတူးခြင်းလုပ်ငန်းလည်ပတ်မှု ကာလအတွင်းလိုအပ်သောရေ (တွင်းတူးရွံ့ရည်နှင့်ဘိလပ်မြေရောစပ်ခြင်း အတွက်ရေ (Makeup water) အသုံးပြုခြင်း) တို့တွင် အသုံးပြုသွားပါမည်။ အသုံးပြုရန်နှင့် တစ်ကိုယ် ရေသုံးအဖြစ် အသုံးချရန် အတွက် သောက်သုံးရေချိုကို တွင်းတူးစင်ပေါ်တွင် ထုတ်လုပ်သွားပါမည်။ တူးဖော်ရေးကာလအတွင်း စီမံကိန်းမှနေ၍ သောက်သုံးရေ ၁,၈၄၀ ကုဗမီတာနှင့် စက်မှုလုပ်ငန်းသုံးအဆင့်ရေချို ၅၆၀ ကုဗမီတာအသုံးပြုရန် ခန့်မှန်းထားပါသည်။

(၄) ကုန်းတွင်းလုပ်ငန်းလှုပ်ရှားမှုများ နှင့် ထောက်ပံ့အခြေစိုက်စခန်း

PTTEP SA သည် မြန်မာနိုင်ငံ၊ ရန်ကုန်ရှိ သာကေတထောက်ပံ့အခြေစိုက်စခန်း (TKA) နှင့်ထိုင်းနိုင်ငံ၊ ရနောင်း ပြည်နယ်ဆိပ်ကမ်းရှိ ရနောင်းထောက်ပံ့အခြေစိုက်စခန်း (RSB) တို့ကို ထောက်ပံ့ပို့ဆောင်ရေး အခြေစိုက် စခန်းများအဖြစ် အသုံးပြုသွားပါမည်။ ထောက်ပံ့ရေး ရေယာဉ်များကို အစားအသောက်နှင့်သက်ဆိုင်သော ပစ္စည်းများ၊ ထောက်ပံ့ရေး ပစ္စည်းများ၊ ကေ့စင်းများ/ပြွန်များ (casing/tubing) များ၊ လောင်စာဆီများ၊ တွင်းတူးရေနှင့် အရည်များ ၊ ရေချိုများ၊ ဘိလပ်မြေဆိုင်ရာပစ္စည်းများကို တွင်းတူးစင်သို့ပို့ဆောင်ရာတွင် အသုံးပြုပါမည်။

၃။ ထုတ်လွှတ်မှုများ၊ စွန့်ထုတ်မှုများ နှင့် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု

(၁) စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု

PTTEP SA သည် လုပ်ကွက် ယခု MD-7 ရှာဖွေတူးဖော်ခြင်းစီမံကိန်း၏ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအတွက် အဓိကလုပ်ငန်းစဉ်အဖြစ် PTTEP မြန်မာအဖွဲ့ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုလုပ်ထုံးလုပ်နည်း (Document Code: 11027-PDR-SSHE-503/01-R02) ကို လက်ခံကျင့်သုံးသွားပါမည်။ ယခုတူးဖော်ရေးစီမံကိန်းမှနေ၍ အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်း ၁၆.၁ တန် နှင့် အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်း ၄.၄၇၃ တန်တို့ကို အဆုံးသတ်အနေဖြင့် စွန့်ပစ်ရန်အတွက် ကမ်းခြေသို့ ပြန်လည်ပို့ဆောင်ခဲ့ပါသည်။

(၂) လေထုအတွင်း ထုတ်လွှတ်ခြင်း နှင့် ဖန်လုံအိမ်ဓာတ်ငွေ့များ

လေထုအတွင်း ထုတ်လွှတ်မှုများဆိုင်ရာတွက်ချက်မှုများ၏ရလဒ်များအရ စီမံကိန်းသည် တန်ချိန် CO_2 ၆,၀၉၅.၃၂ တန်နှင့်ညီမျှသော ဓာတ်ငွေ့ပမာဏကို ထုတ်လွှတ်မည်ဟု ခန့်မှန်းရပါသည်။ မြန်မာနိုင်ငံ၏ ၂၀၁၃ ခုနှစ်တွင် ထုတ်လွှတ်ခဲ့သော CO_2 ၂၀၁,၅၀၀,၀၀၀ တန်ချိန်နှင့် ညီမျှသောပမာဏနှင့်နှိုင်းယှဉ်ကြည့်ပါက ဤစီမံကိန်းမှစုစုပေါင်း GHG ထုတ်လွှတ်မှုသည်သိသာထင်ရှားမှုမရှိ (ခန့်မှန်းခြေအားဖြင့် ၀.၀၃၀%)ပါ။ ထို့ကြောင့် ၎င်းသည် ပတ်ဝန်းကျင်ကို သိသိသာသာ ထိခိုက်မှုမဖြစ်စေနိုင်ပါ။

(၃) စွန့်ပစ်ရေ

စီမံကိန်းမှနေ၍ grey-water ၂,၁၂၀ ကုဗမီတာ (ပျမ်းမျှ တစ်နေ့လျှင် ၃၈.၅ ကုဗမီတာ) နှင့် မိလ္လာရေ ၅၃၀ ကုဗမီတာ (ပျမ်းမျှ တစ်နေ့လျှင် ၉.၆၃ ကုဗမီတာ) ရှိသည်ဟု ခန့်မှန်းရသည်။

မိလ္လာရေနှင့် grey-water အတွက်စီမံခန့်ခွဲမှုစနစ်သည် MARPOL 73/78 Annex IV ၏ သတ်မှတ်ချက်ဖြစ်သည့် အနီးဆုံးကမ်းခြေမှ ရေမိုင်၁၂မိုင် (၂၂.၂ကီလိုမီတာ) အကွာအဝေးတွင် မိလ္လာရေများစွန့်ပစ်ရမည်ဆိုသော သဘော်များမှ မိလ္လာရေညစ်ညမ်းမှုကာကွယ်တားဆီးရေးနှင့်အညီ ဆောင်ရွက်ပါမည်။

၄။ စီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာ၊ လူမှုရေးဆိုင်ရာ နှင့် ကျန်းမာရေးဆိုင်ရာ မူဝါဒများ

PTTEP SA စီမံခန့်ခွဲမှုသည် ဘေးကင်းလုံခြုံစိတ်ချရပြီး ကျန်းမာရေးနှင့်ညီညွတ်သောအလုပ်ခွင်တစ်ခုရရှိရန်နှင့် ပတ်ဝန်းကျင်ကိုကာကွယ်သည့်နည်းလမ်းဖြင့် လုပ်ငန်းလည်ပတ်မှုကိုအပြည့်အဝကတိပြုသည်။ ဤကတိကဝတ်များသည် PTTEP ၏ ကော်ပိုရိတ် မျှော်မှန်းချက်၊ ရည်မှန်းချက်၊ တန်ဖိုးထားမှုများ နှင့် PTTEP SSHE မူဝါဒနှင့် အညီဖြစ်သည်။ ဝန်ထမ်းများ၊ ကန်ထရိုက်တာများနှင့် တတိယအဖွဲ့အစည်းဝန်ထမ်းများအားလုံးထံမှနေ၍ တက်ကြွသော တစ်ဦးချင်းပါဝင်မှု၊ တာဝန်ယူမှုနှင့်တာဝန်ခံမှုများကို မျှော်လင့်ပါသည်။ PTTEP SA SSHE စီမံခန့်ခွဲမှုစနစ် (SSHE MS)ကို သက်ဆိုင်သူများအားလုံး၏ ဤအခြေခံမူများရရှိရန် ကြိုးပမ်းအားထုတ်မှုများနှင့် လျော်ညီအောင် ပုံစံရေးဆွဲထားပါသည်။ PTTEP SA နှင့် ကန်ထရိုက်တာများရှိ လိုင်းစီမံခန့်ခွဲမှုအဆင့်အားလုံးသည် ၎င်း၏ SSHE မူဝါဒ နှင့် SSHE MS ကိုအကောင်အထည်ဖော်ရန်နှင့်ထိန်းသိမ်းရန်တာဝန်ရှိပါသည်။ စာရွက်စာတမ်းများကို သင့်လျော်သည့် အကောင်အထည်ဖော်မှုများဖြစ်ပေါ်စေရန် ပုံမှန်အချိန်အပိုင်းအခြားကာလများအတိုင်း ပြန်လည်အကဲဖြတ်ခြင်းနှင့် ပြန်လည်ပြင်ဆင်ခြင်းတို့ကို ပြုလုပ်ပါသည်။

၅။ လိုက်နာဆောင်ရွက်မှုအခြေအနေ

၅.၁ တွင်းတူးဖော်ရေးကာလတွင် ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုလျော့ပါးရေးအစီအမံများ လိုက်နာဆောင်ရွက်မှုရလဒ်

ရလဒ်များအရ စီမံကိန်းသည် ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ပါးစေရေး အစီအမံများအား တူးဖော်ခြင်းအဆင့်တွင် ၁၀၀% လိုက်နာဆောင်ရွက်မှုရှိကြောင်း တွေ့ရှိရပါသည်။

PTTEP SA သည် EIA တွင်သတ်မှတ်ထားသော ထိခိုက်မှုလျော့ပါးသက်သာစေရေးအစီအမံများအားလုံးကို လိုက်နာခဲ့သည်။ အရေးကြီးသည့်အဓိကအချက်များကို အောက်တွင် အကျဉ်းချုပ်ဖော်ပြထားပါသည်။

- **လေထုအရည်အသွေး** – စက်ယန္တရားအားလုံးအတွက် ပုံမှန်စစ်ဆေးခြင်းနှင့် ကြိုတင်ထိန်းသိမ်းကာကွယ်ခြင်းကို ပုံမှန်အချိန်အပိုင်းအခြားအလိုက် PM နှင့် PM အစီအစဉ်ကိုပံ့ပိုးရန် စီမံကိန်းမှအသုံးပြုသော SAP စနစ်နှင့်အညီ ဆောင်ရွက်ခဲ့ပါသည်။

- **ပင်လယ်ရေ နှင့် နုံးအနည်အနှစ်အရည်အသွေး** – WBM နှင့် SBM ကိုနည်းပညာဆိုင်ရာအကြောင်းပြချက်ဖြင့် အသုံးပြုခဲ့ပါသည်။ တွင်းတူးရည်လည်ပတ်စေခြင်း စနစ်ကို တွင်းတူးရည်များအား ပြန်လည်အသုံးပြုရန် ပျံ့နှံ့စွာလည်ပတ်စေခဲ့ပါသည်။ စီမံကိန်းမှအသုံးပြုခဲ့သော ဓာတုပစ္စည်းများနှင့် ဖြတ်စစ္စန့်ပစ်ပစ္စည်းများကို စာရင်းပြုစုထားရှိပြီး ၎င်းတို့ကို ပင်လယ်ရေမျက်နှာပြင်အောက် အနက် ၁၅မီတာတွင် စွန့်ပစ်ပါသည်။ SDS များကိုလည်း ထောက်ပံ့ပေးထားပါသည်။ NCB တွင်းတူးစက်နှင့် ထောက်ပံ့ရေးရေယာဉ်တို့တွင်စွန့်ပစ်ပစ္စည်းထည့်သည့် ပုံများ ထောက်ပံ့ပေးထားပါသည်။ NCB တွင်းတူးစက်နှင့် ထောက်ပံ့ရေး ရေယာဉ် တို့မှ စွန့်ပစ်ပစ္စည်းများကို ကမ်းပေါ်တွင် အသိအမှတ်ပြုလက်မှတ်ရ ကန်ထရိုက် တာမှ စွန့်ပစ်ဖျက်ဆီးရန် ပို့ဆောင်ခဲ့ပါသည်။ PTTEP SA သည် MARPOL 73/78 နှင့် PTTEP SA ၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုလုပ်ထုံးလုပ်နည်းများ၏ သတ်မှတ် ချက် များကိုလိုက်နာဆောင်ရွက်ပါသည်။

- **ပင်လယ်ကြမ်းပြင်ဝိသေသလက္ခဏာများ၊ အဏ္ဏဝါသက်ရှိများ နှင့် အဏ္ဏဝါဂေဟဗေဒ** – PTTEP SA သည် ပင်လယ်ရေနှင့် နုံးအနည်အနှစ်အရည်အသွေးအပေါ် သက်ရောက်မှုများအတွက် ထိခိုက်မှုလျော့ပါးရေးအစီအမံများကို တင်းကျပ်စွာ လိုက်နာအကောင်အထည်ဖော်ဆောင်ရွက်ပါသည်။

- **ငါးဖမ်းသူဒေသခံလူထု/ငါးဖမ်းလုပ်ငန်း** – တွင်းတူးဖော်ခြင်းမစတင်မီတွင် စီမံကိန်းဆိုင်ရာ သတင်းအချက်အလက်နှင့် တွင်းတူးရန် အစီအစီအစဉ်များကို သက်ဆိုင်ရာအဖွဲ့အစည်းများအားလုံးထံ သတင်းပေးပို့ခဲ့ပါသည်။ MOGE မှနေ၍ ပင်လယ်ရေလုပ်သားများအတွက် နို့တစ်စာ (Notice to Mariner) ကို သက်ဆိုင်ရာအဖွဲ့အစည်းများအားလုံးကို ရက် (၃၀) ကြိုတင်၍ အသိပေးထုတ်ပြန်ခဲ့ပါသည်။ တွင်းတူးစက်တစ်ဝိုက်တွင် သီးခြားဇုန် (၅၀မီတာရှိ) ကို သတ်မှတ်ထားရှိပါသည်။

- **သင်္ဘောအသွားအလာ/ရေကြောင်းသွားလာရေး**– တွင်းတူးဖော်ခြင်းမစတင်မီတွင် စီမံကိန်းဆိုင်ရာ သတင်းအချက်အလက်နှင့် တွင်းတူးရန် အစီအစီအစဉ်များကို သက်ဆိုင်ရာအဖွဲ့အစည်းများအားလုံးထံ သတင်းပေးပို့ခဲ့ပါသည်။ MOGE မှနေ၍ ပင်လယ်ရေလုပ်သားများအတွက် နို့တစ်စာ (Notice to Mariner) ကို သက်ဆိုင်ရာ အဖွဲ့အစည်းများအားလုံးကို ရက် (၃၀) ကြိုတင်၍ အသိပေးထုတ်ပြန်ခဲ့ပါသည်။ ရေယာဉ်အချင်းချင်းတိုက်မိမှုများမှကာကွယ်ရန် တွင်းတူးစက်တစ်ဝိုက်တွင် သီးခြားဇုန် ၅၀၀မီတာကို သတ်မှတ်ထားရှိပါသည်။ ထို့အပြင် သင့်လျော်သောမီးလုံးများ၊ အချက်ပြသင်္ကေတများကို NCB တွင်းတူးစက်တစ်ဝိုက်နှင့် ထောက်ပံ့ရေး ရေယာဉ်များတွင် ထောက်ပံ့တပ်ဆင်ပေးထားပါသည်။

၅.၂ မတော်တဆဖြစ်ရပ်များအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုလျော့ပါးစေရေးအစီအမံများ လိုက်နာဆောင်ရွက်မှု ရလဒ်

ရလဒ်များအရ စီမံကိန်းသည် မတော်တဆဖြစ်ရပ်များအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးစေရေး အစီအမံများကို ၁၀၀ % လိုက်နာဆောင်ရွက်မှုရှိပါသည်။

- **ရေယာဉ်များတိုက်မိခြင်း** – PTTEP ၏ SSHE စီမံခန့်ခွဲမှုစနစ်ကို ပြုစုထားပြီး အလုပ်သမားများနှင့် ကန်ထရိုက်တာများအားလုံးကို တင်းကျပ်စွာ လိုက်နာဆောင်ရွက်စေပါသည်။ တွင်းတူးဖော်ခြင်း မစတင်မီတွင် စီမံကိန်းဆိုင်ရာ သတင်းအချက်အလက်နှင့် တွင်းတူးရန်အစီအစဉ်များကို သက်ဆိုင်ရာအဖွဲ့အစည်းများ အားလုံးထံ သတင်းပေးပို့ခဲ့ပါသည်။ MOGEမှနေ၍ ပင်လယ်ရေလုပ်သားများအတွက်နှိုတစ်စာ (Notice to Mariner) ကို သက်ဆိုင်ရာအဖွဲ့အစည်းများ အားလုံးကို ရက် (၃၀) ကြိုတင်၍ အသိပေး ထုတ်ပြန်ခဲ့ပါသည်။ တွင်းတူးစက်တစ်ဝိုက်တွင် သီးခြားဇုန်၅၀၀မီတာကို သတ်မှတ်ထားရှိပါသည်

- **မတော်တဆယိုဖိတ်မှုများ** – PTTEP ၏ SSHE စီမံခန့်ခွဲမှုစနစ်ကို ပြုစုထားပြီး အလုပ်သမားများနှင့် ကန်ထရိုက်တာများအားလုံးကို တင်းကျပ်စွာ လိုက်နာဆောင်ရွက်စေပါသည်။ စီမံကိန်းမှနေ၍ ဝန်ထမ်းများအားလုံးနှင့် ကန်ထရိုက်တာများအားလုံးကို PTTEP ၏ အစီအစဉ်နှင့် စံသတ်မှတ်ချက်များကို သေချာစွာလိုက်နာဆောင်ရွက်စေပါသည်။

- **ရေနံတွင်းပေါက်ကွဲမှု** – PTTEP ၏ SSHE စီမံခန့်ခွဲမှုစနစ်ကို ပြုစုထားပြီး အလုပ်သမားများနှင့် ကန်ထရိုက်တာများအားလုံးကို အကောင်အထည်ဖော်ဆောင်ရွက်စေပါသည်။ စီမံကိန်းမှနေ၍ ဝန်ထမ်းများ အားလုံးနှင့် ကန်ထရိုက်တာများအားလုံးကို PTTEP ၏ အစီအစဉ်နှင့် စံသတ်မှတ်ချက်များကို သေချာစွာလိုက်နာဆောင်ရွက်စေပါသည်။

- **မီးလောင်မှု နှင့် ပေါက်ကွဲခြင်း** –စီမံကိန်းမှနေ၍ စီမံကိန်းဧရိယာအတွင်းတွင် မီးအကာအကွယ်ပစ္စည်းများ နှင့် အသက်ကယ်ပစ္စည်းများနှင့် အသုံးပြုပုံလက်စွဲကို ထောက်ပံ့ပေးထားပါသည်။ ထို့အပြင် အရေးပေါ်နှင့် အကျပ်အတည်းစီမံခန့်ခွဲမှုအစီအစဉ်ကို ထောက်ပံ့ပေးထားပြီး အရေးပေါ်တုန့်ပြန်မှုဆိုင်ရာ ဇာတ်တိုက်လေ့ကျင့်မှုများကို ဆောင်ရွက်ထားပါသည်။ သို့ရာတွင် တွင်းတူးခြင်းအဆင့်တွင် မည်ကဲ့သို့သော အရေးပေါ်အခြေအနေမျှမဖြစ်ပေါ်ခဲ့ပါ။

၅.၃ ပတ်ဝန်းကျင်ဆိုင်ရာစောင့်ကြည့်စစ်ဆေးခြင်းရလဒ်

EIA တွင်သတ်မှတ်ထားသော မိလ္လာ၊တွင်းတူးရွဲရည်၊ ဖြတ်စ နှင့် စတော့ဘာရိုက်စောင့်ကြည့်စစ်ဆေးခြင်းအပါအဝင် EIA တွင် ဖော်ပြထားသော ပတ်ဝန်းကျင်ထိခိုက်မှုစောင့်ကြည့်စစ်ဆေးခြင်းကို အပြည့်အဝလိုက်နာဆောင်ရွက်ခဲ့ပါသည်။

(၁) တွင်းတူးရွဲ့ရည်၊ ဖြတ်စ နှင့် စတော့ဘာရိုက် စောင့်ကြည့်စစ်ဆေးခြင်း

- **တွင်းတူးရွဲ့ရည်နှင့်ဖြတ်စများရှိ ကလိုရိုဒ် ပါဝင်မှု**

  တွင်းတူးရွဲ့ရည်နှင့်ဖြတ်စများကို တွင်းတူးခြင်းကာလအတွင်း ၂၀၂၀ခုနှစ် ဖေဖော်ဝါရီလတွင် စီမံကိန်းဝန်ထမ်းများမှ နမူနာကောက်ယူခဲ့ပါသည်။ ကလိုရိုဒ် (WBM အတွက်) ရလဒ် ၂ ခုလုံးမှာ ၀.၃၄ % w/w ဖြစ်ပါသည်။

- **ဖြတ်စများပေါ်ရှိဆီ ပါဝင်မှု (SBM အတွက်)** ဖြတ်စနမူနာများကို တွင်းတူးခြင်းကာလအတွင်း ၂၀၂၀ခုနှစ် ဖေဖော်ဝါရီလတွင် စီမံကိန်းဝန်ထမ်းများမှ ကောက်ယူခဲ့ပါသည်။ ရလဒ်များအရ %OOC (ခြောက်သွေ့အလေးချိန်) မှာ ၆.၂၀ %ဖြစ်ပြီး စံသတ်မှတ်ချက် များနှင့် ကိုက်ညီမှုရှိပါသည်။

- **စတော့ဘာရိုက်ရှိ စုစုပေါင်း မာကျူရီ နှင့် စုစုပေါင်းကဒ်မီယံ ပါဝင်မှု**

  စတော့ဘာရိုက်များကို တွင်းတူးခြင်းကာလအတွင်း ၂၀၂၀ခုနှစ် ဖေဖော်ဝါရီလတွင် စီမံကိန်းဝန်ထမ်းများမှ နမူနာကောက်ယူခဲ့ပါသည်။ ရလဒ်များအရ စုစုပေါင်းမာကျူရီ (စတော့ဘာရိုက်ရှိ) တန်ဖိုးသည် ၀.၄၅၃၃mg/kg (ခြောက်သွေ့အလေးချိန်) ရှိပြီး စုစုပေါင်းကဒ်မီယံ (စတော့ဘာရိုက်ရှိ) တန်ဖိုးသည် ND (စမ်းသပ်တွေ့ရှိခြင်းမရှိသောရလဒ်) ဖြစ်ပြီး ၎င်းတို့သည် စံသတ်မှတ်ချက်များနှင့် ကိုက်ညီမှုရှိပါသည်။

(၂) မိလ္လာရေဆိုးစောင့်ကြည့်စစ်ဆေးခြင်း

မိလ္လာရေဆိုးစောင့်ကြည့်စစ်ဆေးခြင်း ကို ၂၀၁၉ ခုနှစ် ဒီဇင်ဘာလ ၁၁ ရက်နေ့တွင် NCB Rig ရှိ မိလ္လာရေဆိုးသန့်စင်ရေးစနစ်ရေထုတ်ပေါက်မှ ရယူစစ်ဆေးခဲ့ပါသည်။ ရလဒ်များကို Resolution of the Marine Environment Protection Committee MEPC.159 (55) နှင့် နှိုင်းယှဉ်ကြည့်ပါက Thermo Tolerant Coliform Bacteria (FCB) နှင့် COD မှအပ BOD နှင့် pH ရလဒ်များသည် MEPC.159 နှင့် ကိုက်ညီမှုရှိသည်ကိုတွေ့ရှိရပါသည်။ သို့သော်လည်း တိုင်းတာမှုညွှန်းကိန်း (ပါရာမီတာ) များအားလုံးသည် မိလ္လာရေဆိုးဆိုင်ရာ ညစ်ညမ်းမှုတားဆီးရေး အသိအမှတ်ပြုလက်မှတ်ပါကန့်သတ်မှတ်များနှင့်ကိုက်ညီမှုရှိစေရန် မိလ္လာရေဆိုးသန့်စင်ခြင်းစနစ်ကို ပိုမိုတိုးတက် ကောင်းမွန်အောင် စဉ်းစားဆောင်ရွက်ရမည်ဖြစ်ပါသည်။

(၃) အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းစောင့်ကြည့်စစ်ဆေးခြင်း

တွင်းတူးခြင်းအဆင့်အတွက် အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းစောင့်ကြည့်စစ်ဆေးခြင်းကို PTTEP SA က ဆောင်ရွက်ခဲ့ပါသည်။ တွင်းတူးခြင်းကာလအတွင်း အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်း ပမာဏ ၄.၄၇၃ တန် နှင့် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းပမာဏ၁၆.၁ တန် တို့ထွက်ရှိပါသည်။

(၄) လုပ်ငန်းခွင်ဆိုင်ရာကျန်းမာရေးစီမံခန့်ခွဲမှုစောင့်ကြည့်စစ်ဆေးခြင်း

PTTEP SA သည် SSHE စီမံခန့်ခွဲမှုလက်စွဲ နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ ဘေးကင်းလုံခြုံသောကျန်းမာရေး နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှုစနစ် (SSHE-MS) အတွက် သင်တန်းအစီအစဉ်တို့ကို ထောက်ပံ့ပေးခဲ့ပါသည်။ အခြားဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာစံသတ်မှတ်ချက်များကို ကန်ထရိုက်တာအနေဖြင့် PTTEP SA ၏ အစီအစဉ်အတိုင်းလိုက်နာဆောင်ရွက်နိုင်စေရန် ထောက်ပံ့ပေးထားပါသည်။ ပြည်သူလူထုနှင့်လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ဆိုင်ရာ စောင့်ကြည့်စစ်ဆေးခြင်းကို ဆောင်ရွက်ခဲ့ပါသည်။ ထိုသို့ဆောင်ရွက်ရာတွင် အလုပ်ချိန်အတွင်း မတော်တဆဖြစ်မှုများ (ဖြစ်ပေါ်စေသည့်အကြောင်းအရာ၊ မတော်တဆမှု အတိုင်းအတာ၊ နှင့် ထိခိုက်မှုလျော့ပါးရေးအစီအမံများအပါအဝင်) ကို မှတ်တမ်းတင်ထားပါသည်။ EIA အစီရင်ခံစာတွင် ဖော်ပြထားသည့် အစီအမံများအတိုင်းစောင့်ကြည့်စစ်ဆေးခြင်းအစီအစဉ်နှင့်အစီရင်ခံခြင်းကို လုပ်ငန်း လည်ပတ်မှုကာလတစ်လျှောက်လုံး ဆောင်ရွက်ခဲ့ပါသည်။ တွင်းတူးခြင်းလုပ်ငန်းလှုပ်ရှားမှုများအတွင်း ရှေးဦးသူနာပြုစုခြင်းဆိုင်ရာမတော်တဆဖြစ်ရပ် (FAC) တစ်ခု ရှိခဲ့ပြီး ယိုဖိတ်ခြင်း (သို့မဟုတ်) ယိုစိမ့်ခြင်းများမရှိခဲ့ပါ။ အလားတူမတော်တဆဖြစ်ရပ် ထပ်မံဖြစ်ပွားခြင်းမရှိစေရန် ပြင်ဆင်ရေးဆောင်ရွက်ချက်များကို အဆိုပြု/အကောင်အထည်ဖော်ခဲ့ပါသည်။

Chapter 1
Introduction

1.1 Introduction

The Myanmar Offshore area consists of 38 petroleum concession blocks, covering an area of about 270,000 km^2. Block MD-7 is a deepwater block located in the Gulf of Moattama in the Andaman Sea, offshore Myanmar. The total area of Block MD-7 is 7,798 km^2. The water depth of Block MD-7 ranges from approximately 700 – 3,000 m. The proposed exploration well (Well-1 or Project Site or Project Area) is located within the upper northeast section of Block MD-7. The project site is 660 km south of Yangon, 425 km southwest of Dawei, 330 km southwest of Myeik and 280 km northeast of Kawthoung, Myanmar. Water depth at the proposed well location is 2,310 m.

PTTEP South Asia Limited (PTTEP SA) has been granted the Production Sharing Contract (PSC) for offshore Block MD-7, owned by Myanma Oil & Gas Enterprise (MOGE). PTTEP SA is the Operator of the Production Sharing Contract (PSC) for Block MD-7.

According to the Environmental Impact Assessment Procedure (EIA) issued by Ministry of Natural Resources and Environmental Conservation (MONREC) – Notification No. 616/ 2015 the project is classified as an EIA type economic activity. Therefore, Environmental Resources Management Co. Ltd. (ERM) and local partner Sustainable Environment Myanmar Co. Ltd. (SEM) have been contracted by PTTEP SA to prepare an environmental impact assessment report (EIA) for the proposed exploration drilling project ("the Project"). The Environmental Impact Assessment (EIA) Report of the Project was submitted to Myanma Oil and Gas Enterprise (MOGE) and Environmental Conservation Department (ECD) on 30th August 2019, according to the submission letter no. PTTEP SA. 13253/01-2555/2019 (Appendix A-1). After that ECD called reviewed team meeting on 20th February 2020 and requested PTTEP SA to revise the EIA report. Then PTTEP SA submitted the revised EIA report on 28th April 2020 (Appendix A-2). EIA report was approved on 5th August 2020 by MOGE and 27th July 2020 by ECD according to the approval letter number MD – (100) 3/6 (1522) 2020 and EIA-2/ Petero (1867(a)/2020) respectively (Appendix A-3).

As per commitment in EIA Report, PTTEP SA has the responsibility to follow the environmental mitigation and monitoring measures including submits the monitoring report to MOGE and ECD. Therefore, PTTEP SA, as the project owner, has assigned a qualified third party, REM-UAE Laboratory and Consultant Company Limited to perform compliance audit of the mitigation measures and perform the monitoring at frequency specified in the EIA's environmental management plan and report the results to MOGE and ECD as prescribing in EIA .

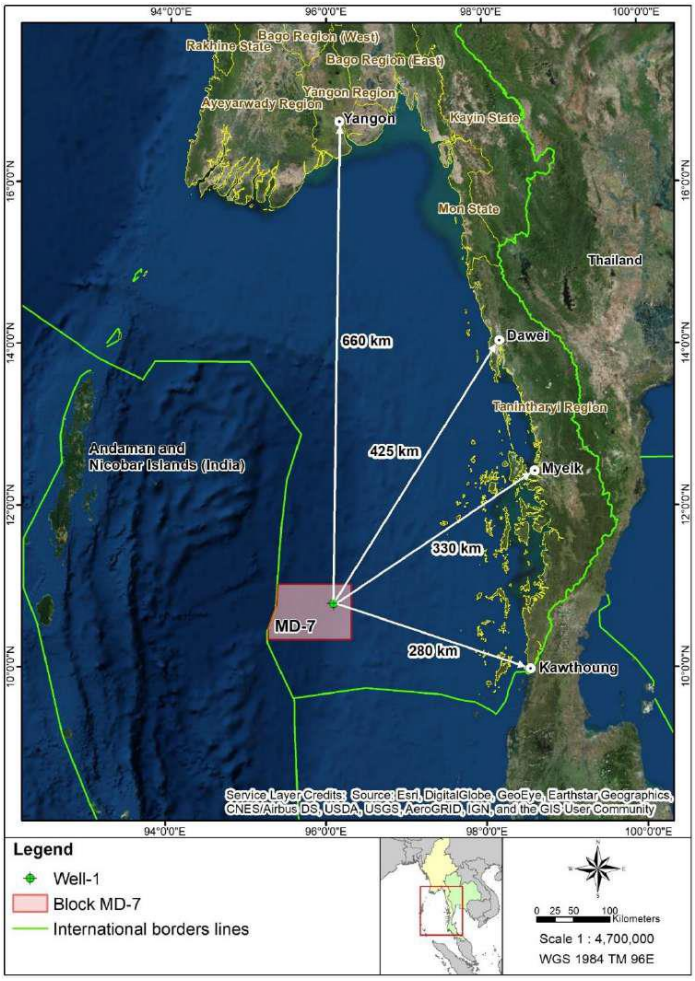
1.2 Objective

The main objectives of this report are:

- To evaluate the effectiveness of implementation of the Environmental Management Plan, including both mitigation and monitoring measures, defined in the EIA report
- To report any potential problems or obstacles and propose recommendation for improvement in order to ensure the effectiveness of the prevention and mitigation measures.

1.3 Project Location

Block MD-7 is located in the Gulf of Moattama in the Andaman Sea, offshore Myanmar, with the block located approximately 640 km south of Yangon, and 300 km southwest of Myeik, and 230 km west of Kawthoung, Myanmar. The water depth of Block MD-7 ranges from approximately 700 – 3,000 m (Figure 1-1)



Source: ERM, 2019

Figure 1-1 Location of Block MD-7

PTTEP SA plans to drill one (1) exploration well in Block MD-7. The proposed well is located in water depths of approximately 2,310 m. Well coordinates and location are presented in Table 1-1 and Figure 1-2 respectively.

Table 1-1 Well Coordinates

Well Name	Coordinates (UTM Datum WGS 84)		Approximately Water Depth (m)
	East (X)	North (Y)	
Well-1	510131	1194351	2,310

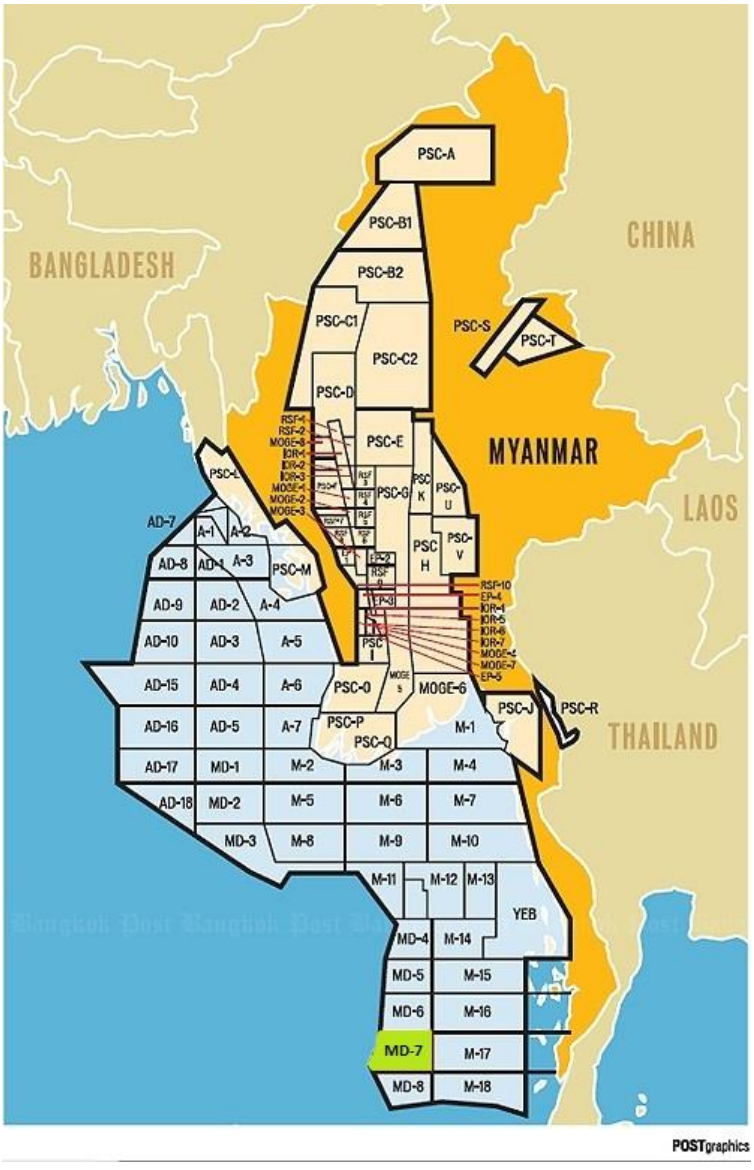


Figure 1-2 The Concession Map of Myanmar and Location of Block MD-7

1.4 Status of Current Operations

Current operation of Exploration Drilling Campaign in Block MD-7 is in drilling phase, the overview of the project as shown in Figure 1-3.

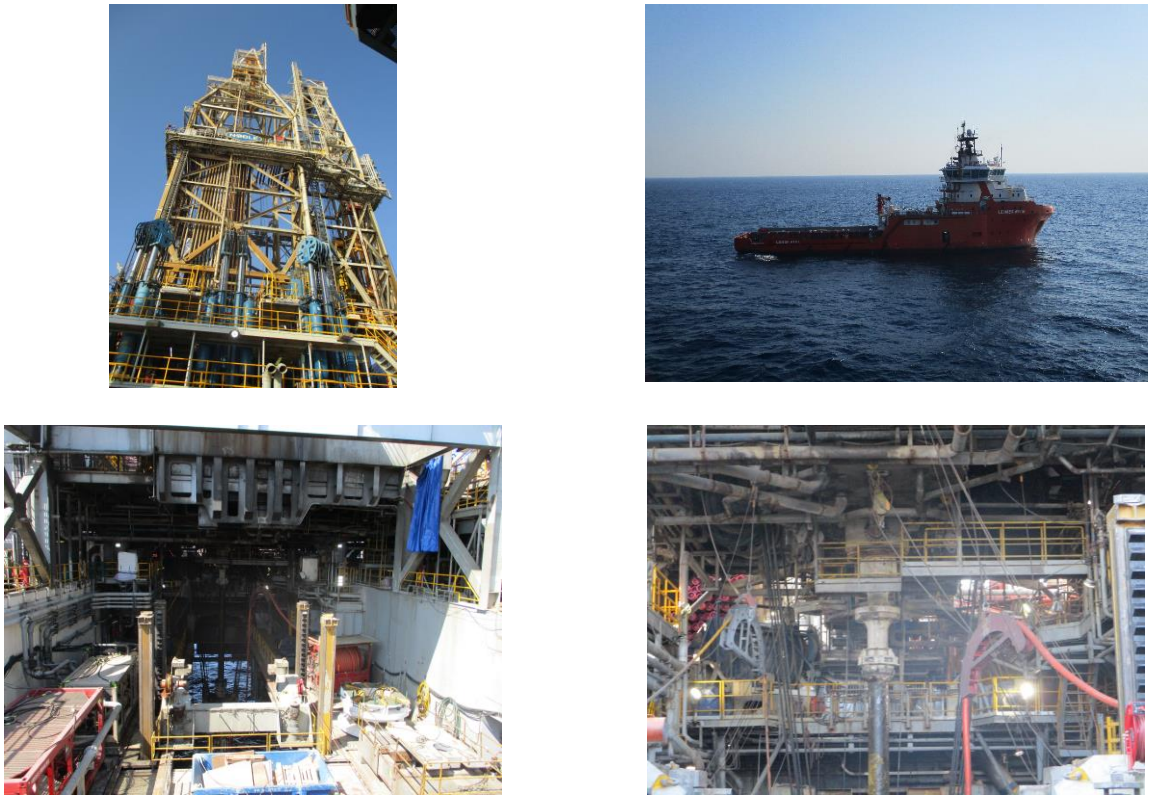


Figure 1-3 Exploration Drilling Campaign in Block MD-7 in drilling phase

1.5 Components of Project's Facilities

Before beginning of drilling operations, PTTEP SA will coordinate with relevant government authorities and stakeholders via a "Notice to Mariners", sent to the Myanma Oil and Gas Enterprise (MOGE), at least four weeks prior to the campaign. This is to inform stakeholders of the schedule of the Project in order to allow time for them to remove their fishing gears (if any) from the drilling area as well as to avoid fishing in these locations.

Descriptions for each component of project's facilities in drilling phase are summarised in below subsections.

1.5.1 Logistics and Utilities

1) Transportaion

Supply vessels will transport catering provisions, supplies, casing/tubing, fuel, drilling water, fresh water, mud and cementing materials to the drilling rig. Crews will be transported by crew boat and/or helicopter. Heliports are located in Yangon and Kawthaung, Myanmar. PTTEP SA will use its Thaketa Supply Base (TKA) in Yangon and Ranong Supply Base (RSB) in the port of Ranong Province (Thailand) as logistic bases.

2) Energy Use

The primary energy source for the Project is diesel. Diesel will be used as fuel to power the various vessels, equipment, generators and the Drilling Rig. Estimations of the Project fuel usage on vessels and the Drilling Rig during drilling phase are provided in Table 1-2.

Table 1-2 Estimated Fuel (Diesel) Use on Project's Vessels and Drilling Rig during Drilling Phase

Activity/Type of Vessel	Quantity of Fuel Use (m^3/vessel/day)	Number of Units	Operational Duration (days)	Total Quantity(m^3)
Drilling Phase				
Drilling rig	20	1	40	800
Material and equipment transport / support vessel	5	2	40	400
Total Fuel Use during Drilling Phase				**1,200**

3) Water Use

The Project's activities will utilize fresh water for various purposes such as domestic use, drinking, and operational uses such as deck washing and water required during the drilling operation (to be used as makeup water for the drilling mud and cement mixing).

Potable fresh water will be produced on-board the drilling rig for consumption and domestic use. Estimated fresh water usage is 200 Litres per day per person. Semi-submersible rigs are typically equipped with on-board water makers with typical capacity of 1,000 barrels/day (about 159 cu.m/day). This is more than enough to meet the demands of the crew on the drilling rig. Drinking water on support vessels is typically bottled water brought from shore.

Makeup water for the drilling mud and cement mixing water will also be produced on-board the drilling rig by the on-board water makers. It is estimated that a total of 560 m^3 of industrial grade fresh water (to be used as makeup water for the drilling mud, cement mixing and losses) and 1,840 m^3 will beof potable waterrequired during the drilling operation.

The Project's activities in each drilling phase utilize water for various purposes, as shown in Table 1-3.

Table 1-3 Type of Water and Volume of Water Use

Activity/Type of Vessel	Total Personnel	Operational Duration (days)	Total Potable Water (m^3) [1]	Source of Potable Water	Total Industrial Fresh Water (m^3)	Source of Non-Potable Water
Drilling Phase						
Drilling rig	200	40	1,600	On-board	560	On-board
Material and equipment transport / support vessel	30	40	240	Shore	-	-
Total Water (Drilling Phase)			**1,840**	**-**	**560**	**-**

Remark : [1] Based on 200 L (0.2 m3) per person per day.
"On-board" means water produced from on-board makers. "Shore" means water transported via support vesselfrom shore base, either TKA or RBS.

4) Onshore Activities and Support Base

PTTEP SA will use its Thaketa Supply Base (TKA) in Yangon, Myanmar and the Ranong Supply Base (RSB) in the port of Ranong Province, Thailand as logistic bases. Supply vessels will transport catering provisions, supplies, casing/tubing, fuel, drilling water, fresh water, mud and cementing materials to the drilling rig.

1.5.2 Emissions, Discharges and Waste Management

1) Waste Management

PTTEP SA will adopt the PTTEP Myanmar Asset Waste Management Procedure (Document Code: 11027-PDR-SSHE-503/01-R02) as the main procedure for waste management of this MD-7 Exploration Drilling campaign. This Procedure is developed to ensure correct and safe handling and disposal of non-hazardous and hazardous waste generated from PTTEP sites. The Procedure applies to all sites managed by PTTEP Myanmar Asset and to all personnel including contractors. The plan deals with waste classification, segregation, handling, temporary sites, waste transfer, storage, disposal facilities, records and reporting of non-hazardous waste and hazardous waste produced by PTTEP.

The project already proceeded exploration drilling for 1 well, the amount of cutting disposed during driiling well operation of MD-7 exploration activities are presented in Tabla 1-6.

Table 1-4 Management of Waste for Offshore Operation

Type of Waste	Waste Management
General non-hazardous waste	• Store in durable container and clearly label. • Transfer to Thaketa Support Base (TKA) then immediately continue delivery to either MOGE or Yangon City Development Committee (YCDC) or other permitted waste facility for final disposal. • Food waste and sewage will be treated onsite aligning with MARPOL 73/78 and Discharge to the sea.
Hazardous waste	• Stored in waste skip. • Transfer to TKA and then immidiatly deliver to permitted waste management facilities (Golden Dowa Eco-System Myanmar Co., Ltd. (GEM) for final disposal.

Table 1-5 Quantity of Non-Hazardous Waste and Hazardous Waste Generated During the Project

Type of Waste	Quantity of generated waste for drilling (ton)
Non-hazardous waste	16.1
Hazardous waste	4.473

Table 1-6 The amount of cutting disposed during exploration activities

Amount WBM Cutting Disposed (Kg)	Amount SBM Cutting Disposed (Kg)
635,962	89,607

2) Air Emission and Greenhouse Gases

The principal atmospheric greenhouse gas emissions during Project will comprise exhaust emissions, primarily carbon dioxide (CO_2), Nitrogen oxides (NO_X), methane (CH_4) with small quantities of un-burnt hydrocarbons and smoke/particulates discharged from propulsion and power generation equipment on the vessels and drilling rig.

Potential exhaust emissions from diesel engines will be estimated using Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry (API, 2009 (2)). From the results of emissions calculations expected that the Project will generate 6,095.32 tons CO_2 (equivalent). Compared to Myanmar's CO_2 release of 201,500,000 tons CO_{2e} in 20131, the total GHG releases from this project are not significant (approximately 0.0030%), and therefore will not significantly impact the environment.

3) Wastewater

Oil Contaminated Wastewater

Oil contaminated wastewater may be generated by every phase of the project. The potential sources of oil contaminated wastewater are from the vessels and drilling rig. Details of oil contaminated wastewater management during drilling phase are presented in Table 1-7

Table 1-7 Management of Oil Contaminated Water during Drilling Phase

Source of origin / Type	Management
Water generated from the machinery and engine area (drilling rig's engine room)	Send to oil filtering equipment to treat oil-contaminated water and reduce oil contamination in the water. Oil contamination in the water shall not exceed 15 ppm before discharging to the sea according to MARPOL 73/78 Annex 1 Regulations for the Prevention of Pollution by Oil. In the case that oil filtering equipment is out of order, or a drilling rig without oil filtering equipment is used, oil contaminated water from engine room, machinery and engine area will be collected, stored in containers on the drilling rig and sent to Onshore Support Base for disposal activity. Separated oil is stored in containers and its volume is recorded before sending to the Onshore Support Base for further disposal by licensed contractor.
Deck drain (oil-ontaminated water in case of oil spill)	In case of oil spill, absorbents are used in cleaning and then they are stored in separated containers for onshore disposal as hazardous waste by licensed contractor.

Table 1-7 Management of Oil Contaminated Water during Drilling Phase

Source of origin / Type	Management
Oil ontaminated water due to maintenance activity and equipment cleaning.	Store in containers and record volume before sending to the Onshore Support Base for further disposal by licensed contractor that is granted with permission from relevant government agencies.

Sewage and Grey Water

The principal effluents discharged to the marine environment during the project will comprise grey water (laundry/discharges and other wash water) and sewage (black water – human body wastes). Generation rate of grey water from shower, wash basin, washing area, and kitchen, is calculated as 80% of water consumption (200 litres/person/day). Sewage generation rate is calculated as 40 litres/person/day. The volume of sewage and grey water which will be generated by the Project during drilling phase is estimated in Table 1-8.

The management system for sewage and grey water will conform with MARPOL 73/78 Annex IV Prevention of Pollution by Sewage from Ships which states: the discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than three nautical miles (5.56 km) from the nearest land; sewage which is not comminuted or disinfected has to be discharged at a distance of more than 12 nautical miles (22.2 km) from the nearest land.

Table 1-8 Estimated Volume of Sewage and Grey Water Generated by Project during *Drilling Phase*

Activity/Type of Vessel	Total Personnel	Operational Duration (days)	Total Grey Water Discharged to Sea (m^3) [1]	Total Sewage Discharged to Sea (m^3) [2]
Drilling rig	200	40	1,280	320
Material and Equipment transport/support vessels	30	40	192	48
Total sewage and grey water (*Drilling Phase*)			1,472 ($\bar{x}$ 36.8 m^3/day)	368 ($\bar{x}$ 9.2 m^3/day)

Remarks : [1] Based on past experience, greywater generation rate is 80% of the amount of water use (200 litres) or equal to 0.16 m^3/person/day

[2] Based on past experience, sewage generation rate is 20% of the amount of water use (200 litres) or equal to 0.04 m^3/ person/ day , $\bar{x}$ = average

1.5.3 Project's Environmental, Social and Health Policies

PTTEP SA management is fully committed to providing a safe, secured and healthy workplace and conducting its operations in a manner that protects the environment. These commitments are in accordance with PTTEP's Corporate Vision, Mission, and Values and PTTEP' s SSHE Policy. Proactive individual involvement, responsibility and accountability are expected of all employees, contractors and third-party personnel. PTTEP SA SSHE Management System (SSHE MS) is designed to align all stakeholders' efforts to enable attainment of these principles.

All levels of line management at PTTEP SA are responsible for implementing and maintaining its SSHE policy and SSHE MS. Both documents are reviewed and revised at regular intervals.

PTTEP'S SSHE Policy

PTTEP Myanmar Asset is committed to safe Exploration and Production (E&P) Operations in Myanmar with an ultimate goal of "Target Zero - Nobody Gets Hurts in Our Operations" which covers (1) Zero Injury, (2) Zero Major Accident (e.g. zero major hydrocarbon leak, vehicle accident, ship collision), and (3) Zero Spill or External Complaint (e.g. zero complaint by authorities/ communities/ sea users).

To accomplish this, PTTEP Myanmar Asset Implements Safety, Security, Health and Environmental Management System (SSHE-MS) that outlines the main principles and accountabilities to drive for continuous improvement. We are committed to:

- Comply with Myanmar SSHE laws, other applicable requirements and PTTEP Standards.
- Perform hazard identification and SSHE risk assessments so that risks are As Low As Reasonably Practicable (ALARP).
- Hold employees accountable for SSHE performance by setting and monitoring SSHE Plans and KPIs.
- Prevent operational and process incidents by implementing asset integrity programs and monitoring of Safety Critical Elements addressed in Safety Cases and complying with Management of Change (MOC) Standard.
- Work with contractors and suppliers to achieve PTTEP's SSHE requirement.
- Ensure all employees and contractors are assessed and maintain the required level of job and SSHE competency.
- Apply "Stop Work Authority Policy" for unsafe work by implementing Behavior-Based Safety (BBS) programs to improve positive SSHE culture.
- Implement security management for potential threats to safeguard personnel, assets, information and reputation.
- Promote occupational health and hygiene in the workplace by conducting health risk assessments, medical surveillances, education and regular industrial hygiene monitoring.

- Prevent environmental impacts by strictly following the mitigation measures stated in Environmental Impact Assessment.
- Promote sustainable development by implementing waste management, greenhouse gas reduction and energy efficiency programs.
- Report, investigate and analyse SSHE incidents to prevent recurrence and close out corrective actions with evidence.
- Ensure that emergency and crisis management plans are proactive and effective.
- Ensure policy and SSHE Management System compliance through regular SSHE audits and Senior Management visits with corrective actions follow up for continuous improvement.

Strong leadership and commitment is a key successful implementation of this policy which is required from PTTEP employees and contractors at all levels.

1.5.4 Environmental Monitoring and Mitigation Measure Implementation Compliance

According to EIA, the environmental mitigation measures implementation audit which considered environmental issues and essential impacts that may occur were conducted in the drilling phase of the project by REM- UAE, as the environmental consultant of the project together with the representation from PTTEP SA. The results were described in Chapter 2. The environmental monitoring measures were implemented during February - March 2020 and the results were presented in Chapter 3 and the conclusion was summarized in Chapter 4.

Chapter 2
Environmental Mitigation Measures Implementation Compliance Audit

Environmental Mitigation Measures Implementation Compliance audit was carried out by REM-UAE Laboratory and Consultant Company Limited together with representatives from PTTEP SA. The audit conducted against the mitigation measures specified in EIA as detailed in Appendix B.

Audit was performed at MD-7 Drilling Rig and document checking by setting 4 levels of evaluation as follows;

- Completely complied on the Mitigation Measures (✓) refers the project can complete comply with the measure without any barriers.
- Mostly complied on the Mitigation Measures (✓) refers the project can mostly comply with the measure without any barriers.
- Do not complied on the Mitigation Measures (×) refers the project cannot comply with the measure because of some barriers.
- Do not have situation follows the Mitigation Measures (**NA**) refers during the project operations do not have any of situation follow the Mitigation Measures.

Although the project does not comply with the mitigation measures, REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions ways. However, PTTEP SA completely complied on the Mitigation Measures, the details are shown in Table 2-1 to Table 2-2 as followed;

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of MD-7

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
Environmental Mitigation Measure					
1. Air Quality	1.1 Air emissions from combustion due to operation of machines and engines installed on drilling rig, support and supply vessels.	1.1.1 Carry out routine inspection and preventive maintenance for all machinery as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion.	✓	- Routine inspection and preventive maintenance for all machinery were conducted as follows routine PM and Inspection Plan which the project used the SAP system to support PM plan.	Figure 2-1 and 2-2
2. Sea water Quality	2.1 Discharge of mud and cuttings into the sea could impact seawater and sediment quality.	2.1.1. Use optimized drilling design to minimize the quantity of mud and cuttings.	✓	- The mud circulation system was provided to circulate mud for recycling to minimize the quantity of mud and cuttings.	Figure 2-4
	2.2 Discharge of oil-containing wastewater (i.e. bilge water, oil-chemical containing wastewater from engine room and deck drain) from vessels and drilling rig may impact seawater quality. 2.3 Discharge of wastewater and sewage from drilling rig, support and supply vessels may impact seawater quality.	2.1.2. Use water-based mud (WBM) and/or seawater for drilling surface holes, and use low toxicity synthetic-based mud (SBM) for drilling intermediate and bottom/ reservoir holes.	✓	- WBM and SBM was used by technical reason. However, the mud circulation system was provided to circulate mud for recycling.	Figure 2-4 and Appendix D

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of MD-7

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
		2.1.3. For SBM drilling, conduct the drilling within a closed system to recycle the mud and prohibit direct discharge of SBM into the sea.	✓	- The project has used mud circulation system to circulated mud for recycling to prevent discharge of SBM into the sea.	Figure 2-4
		2.1.4. During drilling with SBM, oil on cuttings (OOC) discharged into the sea shall comply with applicable standards.	✓	- SBM cuttings treated on board and discharged at 15 m below sea surface as per 2015 IFC EHS Offshore Oil and Gas Development Guideline.	Figure 2-4
		2.1.5. As specified in Myanmar's National Environmental Quality (Emission) Guidelines, cuttings shall be released via Caisson below sea surface to limit area of cuttings dispersion in the sea.	✓	- Cuttings were discharged at 15 m below sea surface to limit area of cuttings dispersion in the sea.	Figure 2-4
		2.2.1. Operate Project vessels in compliance with the requirements under MARPOL 73/78 and PTTEP's Waste Management Procedure	✓	- The project has operated all project vessels in compliance with the requirements under MARPOL 73/78 and PTTEP's Waste Management Procedure.	Appendix F

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of MD-7

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
		2.3.1. Sewage shall be treated by a wastewater treatment system prior to discharge into the sea when in transportation more than 12 nautical miles (22.22 km) from the nearest land. Discharged wastewater must meet requirements of MARPOL 73/78.	✓	- The project has provided an effective wastewater treatment system to treate wastewater and ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73 / 78 before discharge into the sea. Also insist firmly to contractor to comply with this standards. For example, food grinder was provided to grind the food waste to 25 mm before discharge to sea.	Figure 2-13 and Appendix E-1
3. Seabed Characteristics	3.1 The pattern of seafloor sediment topography could be affected by discharge of drilling mud and cuttings.	3.1.1 Use optimized drilling design to minimize the quantity of mud and cuttings discharged.	✓	- The mud circulation system was provided to circulate mud for recycling to minimize the quantity of mud and cuttings discharged.	Figure 2-4

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of MD-7

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
4. Marine Life and Marine Ecology	4.1 Discharge of mud and cuttings may impact marine ecosystem (both pelagic and benthic communities) due to turbidity, hydrocarbon contamination, toxicity of drilling mud and cuttings, and heavy metal/barite contamination.	4.1.1 Implement all mitigation measures for **Item 2.1** above.	✓	- WBM and SBM was used by technical reason. However, the mud circulation system was provided to circulate mud for recycling. Cuttings treated on board and discharged at 15 m below sea surface as per 2015 IFC EHS Offshore Oil and Gas Development Guideline.	Figure 2-4 and Appendix D
	4.2 Waste, wastewater, and discharges from offshore facilities may cause an impact on seawater and sediments, which may indirectly affect the community of marine biota at the surface level and the seabed.	4.2.1 Implement all mitigation measures for **Item 2** above.	✓	- WBM and SBM was used by technical reason. However, the mud circulation system was provided to circulate mud for recycling. The project discharged oil on cuttings (OOC) to sea at 15 m below sea surface and comply with 2015 IFC EHS Offshore Oil and Gas Development Guideline. In addition, the project provided an effective wastewater treatment system to make quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	Figure 2-4 Appendix D, and E-1

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of MD-7

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
Social Mitigation Measure					
5. Fishing Community /Fisheries	5.1 Reduced fishing area due to presence of drilling rig and associated 500 m exclusion zone, as well as presence of support vessels.	5.1.1 At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties (i.e. Department of Fisheries, Ministry of Livestock, Fisheries and Rural Development, and Myanmar Navy).	✓	- The project information and drilling plan was already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties over 30 days in advance.	Appendix A-4
		5.1.2 Establish 500 m safety zone around the drilling rig.	✓	- The project has established 500 m safety zone around the drilling rig.	Appendix A-4
6. Shipping /Navigation	6.1 Marine vessels may obstruct marine navigation during transporting chemicals and waste between the offshore operation area and the Ranong and Thaketa shore bases.	6.1.1 At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties (i.e. Department of Fisheries, Ministry of Livestock, Fisheries and Rural envelopment, and Myanmar Navy).	✓	- The project information and drilling plan was already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties 30 days in advance.	Appendix A-4

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of MD-7

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
	6.2 The presence of the offshore vessels and drilling rig may obstruct navigation.	6.2.1 Establish a 500 m safety zone around the drilling rig and provide support vessels to observe fishing and commercial vessels approaching the safety zone to prevent collision.	✓	- The project has established 500 m safety zone around the drilling rig and provided support vessels for warning off traffic and observe fishing and commercial vessels approaching the safety zone to prevent any collision.	Figure 2-11
		6.2.2 Provide appropriate lights and warning signals on drilling rig and vessels to prevent accidental collision.	✓	- Appropriate lights and warning signals were provided around the NCB Rig and support vessels.	Figure 2-3

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks/ Reference
1. Vessel Collision	1.1 Collisions could potentially occur during transport of materials and rig tow-out. These collisions could have direct impacts on fishing community/fisheries and hipping/navigation, as well as secondary impacts due to obstructions. Collisions could also have impacts on public health and occupational health and safety.	1.1.1 Implement PTTEP's SSHE Management System	✓	- The project has enforced all worker and contractors to strictly implemented PTTEP's SSHE Management System.	-
		1.1.2 At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties (i.e. Department of Fisheries, Ministry of Livestock, Fisheries and Rural Development, and Myanmar Navy).	✓	- The project information and drilling plan was already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties over 30 days in advance.	Appendix A-4
		1.1.3 Establish 500 m safety zone around drilling rig.	✓	- The project has established 500 m safety zone around the drilling rig.	Appendix A-4
2. Accidental Spills	2.1 Accidental spills of drilling fluids, wastes, chemicals, or diesel fuel could occur throughout all Project phases, and they may directly affect surface water quality, and indirectly affect sediment quality and	2.1.1 Implement the relevant components of PTTEP's SSHE Management System, including the following: - PTTEP Emergency and Crisis Management Plan (in case of oil or chemical spills). - PTTEP Spill Contingency Plan.	✓	- The project has complied with the measures by enforced all worker and contractors to strictly implemented the relevant components of PTTEP's SSHE Management System including; - Prepared spill kits and fire protection equipment within project area - Held emergency response drills and exercise for readiness for	Figure 2-6, 2-9, 2-10, 2-11, 2-12 and 2-14

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks/ Reference
	marine ecology. Secondary impacts could also occur to fisheries (due to impacts to fish) or shipping/navigation (due to obstructions associated with clean-ups).	- PTTEP SSHE Training & Competency Standard. - PTTEP Incident Management Standard. - PTTEP Waste Management Plan.		any emergency situation. However, there was no emergency situations during drilling activity. - Provided separate waste container within project area. Moreover, the project has used waste compactor to compress waste before ship to disposed onshore and record and examine the type and quantity of waste also.	
3. Well Blowout	3.1 A blowout can result in the release of hydrocarbons (gas, condensate, oil) into the sea and surrounding environment at high pressure, potentially impacting seawater/sediment quality, marine life and marine ecology, occupational health and safety, and public health.	3.1.1 Implement the relevant components of PTTEP's SSHE Management System including the following: - PTTEP's Blowout Contingency Plan. - In case of oil or chemical spills, follow PTTEP's Emergency and Crisis Management Plan. - PTTEP's Spill Contingency Plan. - PTTEP's SSHE Requirement for Contractor. - PTTEP's SSHE Training and Competency Management Standard.	✓	- PTTEP's SSHE Management System were already prepared and enforced the worker and contractor to implement. The project also enforced the worker and contractor to follow all PTTEP's Plan ans standard. - Regularly check the pressure in drilling well and mud circulation according to PM plan. - Tested and certify BOP in accordance with API 53. - Prepared spill kits and fire protection equipment within project area - Held emergency response drills, However, there was no emergency situations during drilling activity.	Figure 2-5, 2-6, 2-8, 2-9 and 2-14

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks/ Reference
		- PTTEP's Incident Management Procedure. - PTTEP's Offshore Medical Emergency Response Plan (MERP). - PTTEP's Crisis Communication Plan and Crisis Management Plan.			
4. Fire or Explosion	4.1 Fire or explosion could potentially impact air quality, health and safety concerns to PTTEP's employees and contractors, and damage to structures. Secondary impacts from release/spill of chemicals could occur to seawater/ sediment quality, marine life and marine ecology.	4.1.1 Provide fire protection equipment, including fire extinguishers and alarms, on all offshore facilities.	✓	- The project has provided fire protection equipment and life saving equipment within project area and also provide manual for those how to use it. Moreover, the project has held emergency response drills and exercise. However, there was no emergency situations during drilling activity.	Figure 2-7, 2-10 and 2-14
		4.1.2 Implement Emergency and Crisis Management Plan in case of fire or explosion occurrence.	✓	- The project provided Emergency and Crisis Management Plan and enjoined workers and contractors to follow regulation. Moreover, the project has held emergency response drills and exercise. However, there was no emergency situations during drilling activity.	Figure 2-9 and 2-14

Aspects	Summary of Potential Impacts	Mitigation Measures	Status	Details	Remarks/ Reference
		4.1.3 Conduct regular inspections and drills for fire protection equipment	✓	- The project regularly inspects fire protection equipment following to the inspection plan. SAP system are used for supporting the PM plan of this project. Moreover, the project has held emergency response drills and exercise. However, there was no emergency situations during drilling activity.	Figure 2-1 and 2-2

Figure 2-1 Inspection tag on equipment

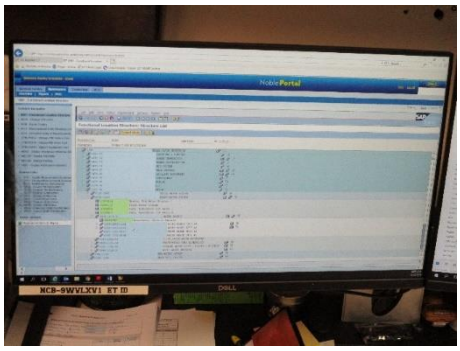


Figure 2-2 Display of SAP System (PM Planning System)

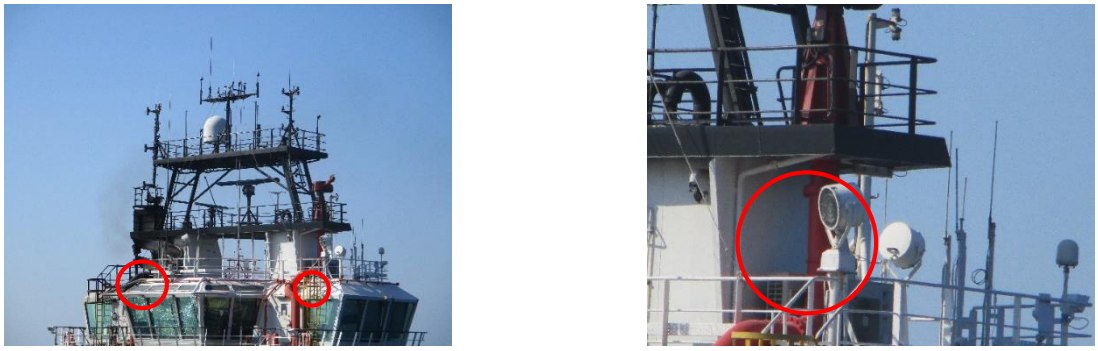


Figure 2-3 Lighting System around NCB Rig and on Support vessels

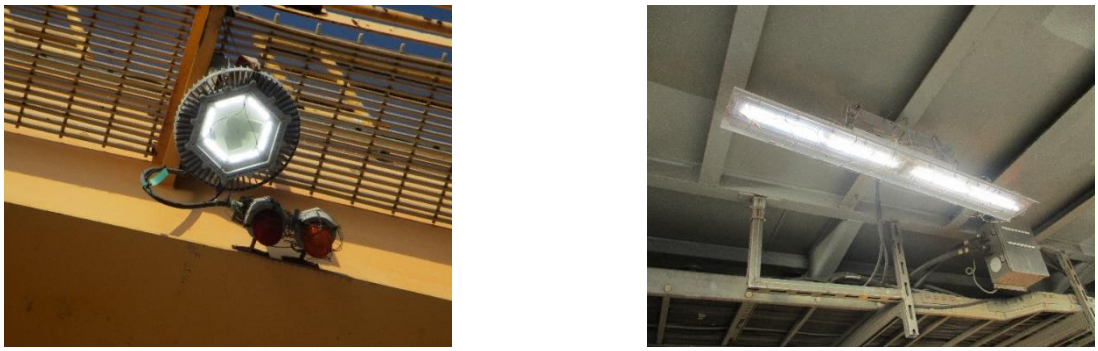


Figure 2-3 Lighting System around NCB Rig and on Support vessels




Mud Circulation System


Degasser

Figure 2-4 Mud Circulation System and Degasser

Figure 2-5 Waste Containers

Figure 2-6 Waste Compactor

Figure 2-7 Life Saving Equipment

Figure 2-7 (cont.) Life Saving Equipment

Figure 2-8 Emergency Drills

Figure 2-9 Spill Kits

Figure 2-10 Fire protection equipment

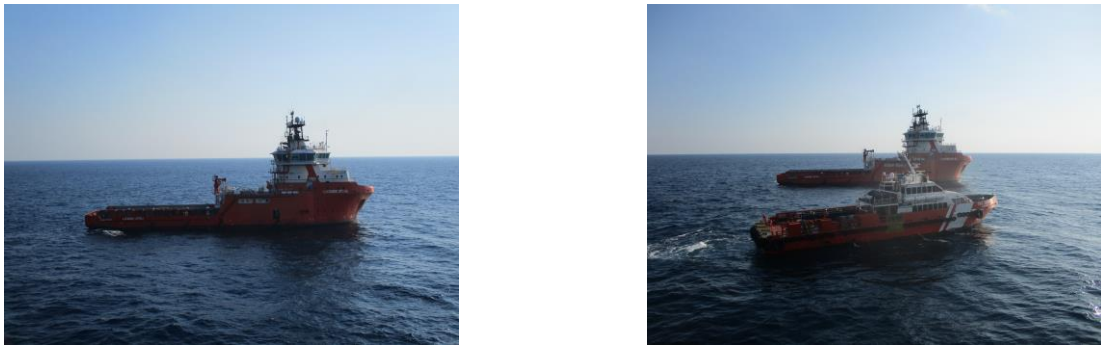
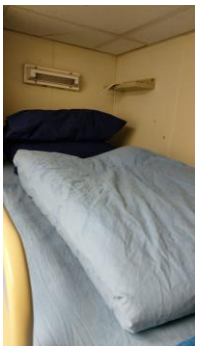


Figure 2-11 Support Vessel of the project

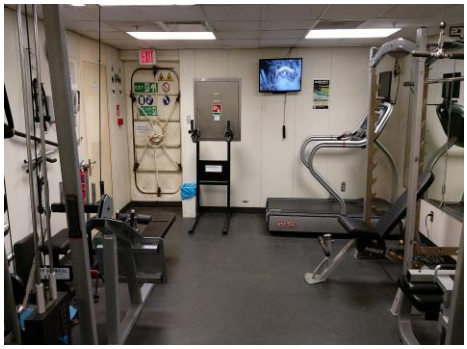
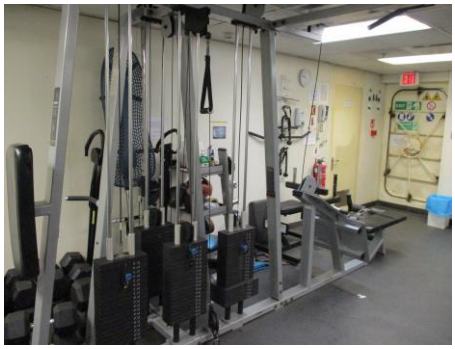
Figure 2-12 Garbage Record Book

Figure 2-13 Food Grinder

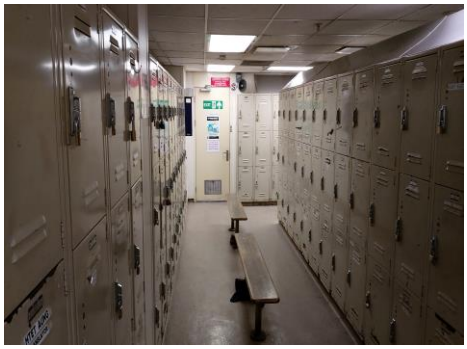
Figure 2-14 Personal Protective Equipment Wearing

Bedroom for staff

Fitness Room

Personal lockers

Sanitary Toilet

Figure 2-15 Facilities for staffs on NCB rig

Canteen

Figure 2-15 (cont.) Facilities for staffs on NCB rig

Chapter 3
Environmental Monitoring Results

Environmental monitoring was conducted as specify in EIA which the project has assigned REM- UAE Laboratory and Consultant Company Limited to performed the environmental monitoring. This chapter presents the environmental monitoring results of Exploration Drilling Campaign in Block MD-7, the detail is presented as follow;

3.1 Environmental Monitoring Plan

Environmental monitoring for Offshore Exploration Drilling Campaign in Block MD-7 has been implemented with 100% compliance as shown in Table 3-1.

Table 3-1 Environmental Impact Monitoring Plan for Exploration Drilling Campaign in Block MD-7 (Drilling Phase)

Environmental Quality	Parameter	Period/Frequency	Location	Implemented	
				Complied	Not complied
1. Mud and cuttings (WBM)	Parameters required by NEQG to be analysed: • Total Mercury (Total Hg) dry weight in stock Barite • Cadmium (Cd) dry weight in stock Barite • Chloride (Cl^-)	Once during drilling	At each potential well location.	• Monitored by REM-UAE Laboratory and Consultant Co. ,Ltd. On February 16, 2020. The result as shown in Content 3.2	-
2. Mud and cuttings (SBM)	Parameters required by NEQG to be analysed: • Oil on Cuttings (OOC) • Total Mercury (Total Hg) dry weight in stock Barite • Cadmium (Cd) dry weight in stock Barite	Once during drilling	At each potential well location.	• Monitored by REM-UAE Laboratory and Consultant Co.,Ltd. On February 24, 2020 The result as shown in Content 3.2	-
3. Sewage	Parameters required by NEQG to be analysed (as per MARPOL 73/78): • Thermtolerant Coliform Bacteria (FCB) • Biochemical Oxygen Demand (BOD) • Chemical Oxygen Demand (COD) • pH	Once during drilling	At each potential well location ; - Sampling from sewage water treatment system discharge point.	• Monitored by REM-UAE Laboratory and Consultant Co.,Ltd. on December 11,2019 during the rig NCB performed the activity for previous PTTEP drilling campaign. The result as shown in Content 3.3	-

Table 3-1 Environmental Impact Monitoring Plan for Exploration Drilling Campaign in Block MD-7 (Drilling Phase)

Environmental Quality	Parameter	Period/Frequency	Location	Implemented	
				Complied	Not complied
4. Fishery and Navigation	• Records of removed fishing gears • Records of complaints and responses • Records of fishing vessels Accident reports	• Record details of removed fishing gears • Record containing details of complaints and responding results • Record containing details on number, type, and duration for fishing boats and other vessels entering the Project area • Report on accidents/incidents with a fishing boats or other vessels during the Project containing	• Project Area	• Monitored by PTTEP SA, During drilling operation, There are no fishing boats and other vessels entering the Project area. However, If such an event occurs he project will implement as specified in the measures.	-
5. Hazardous and Non-hazardous Waste	• Type/volume of waste generated.	• Prepare a record on type and volume of generated waste	• All project vessels and drilling rig	• Monitored by PTTEP SA the details as shown in 3.4	-

Table 3-1 Environmental Impact Monitoring Plan for Exploration Drilling Campaign in Block MD-7 (Drilling Phase)

Environmental Quality	Parameter	Period/Frequency	Location	Implemented	
				Complied	Not complied
6. Accidental Spills or Leaks	• Occurrence of spills or leaks of oil or other chemicals	• Conduct regular observation for occurrence of accidental spills or leaks • If accidental spill or leak occurs, they are to be recorded, reported to relevant authorities, and response measure implemented.	• All project vessels and drilling rig	• Monitored by PTTEP SA, There was incident with worker but no spillage or leakage occured. The details are shown in 3.5	-

3.2 Mud, Cutting and Stock Barite Monitoring

Mud, Cutting and Stock Barite monitoring at NCB Rig as specified in EMP was conducted by REM-UAE Laboratory and Consultant Company Limited for Exploration Drilling Campaign in Block MD-7. The detail as shown in Table 3-2.

Table 3-2 Mud, Cutting and Stock Barite Monitoring Plan

Environmental Quality	Parameter	Location	Period
Mud, Cutting and Stock Barite	1. Chloride (for WBM)	Sampling from Chemical Storage Area at NCB Rig - SHWE NADI-1,17-1/2" SECTION TD (CUTTING)	February 16, 2020
	2. Oil on cuttings (for SBM)	Sampling from Chemical Storage Area at NCB Rig - SHWE NADI-1,12-1/4" SECTION TD (CUTTING)	February 24, 2020
	3. Mercury (in stock Barite) 4. Cadmium (in stock Barite)	Sampling from Chemical Storage Area at NCB Rig - SHWE NADI-1,17-1/2" SECTION TD (STOCK BARITE)	February 16, 2020

3.2.1 Mud, Cutting and Stock Barite Monitoring Method

Details of Mud, Cuttings and Stock Barite monitoring includind parameters and analysis methods are shown in Table 3-3.

Table 3-3 Parameters and Analyses Methods for Mud, Cutting and Stock Barite Monitoring

Parameter	Analysis Method[1/]
1. Chloride (for WBM)	BS 1377 Part 3, 1990
2. Oil on Cuttings (for SBM)	Soxhlet Extraction Method (SM:5520 E)
3. Mercury (in stock Barite)	Acid Digestion and Cold Vapour AAS Method
4. Cadmium (in stock Barite)	Acid Digestion and Direct Air-Acetylene Flame Method

Remarks : [1/] BS = British Standard Method

SM = Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017

U.S.EPA = Test Methods Evaluating Solid Waste, Physical/Chemical Methods (SW 846), United States Environmental Protection Agency

3.2.2 Presevation Methods

All samples were preserved with specific procedure and storage as shown in Table 3-4.

Table 3-4 Monitoring parameter, container and preservation method for Mud, Cutting and Stock Barite

Parameter	Container	Preservation Method [1/]
1. Chloride (for WBM)	Polyethylene Bottle 500 mL	Refrigerate $\leq 6\ ^0C$
2. Oil on Cuttings (for SBM)	Glass Amber 500 mL	Refrigerate $\leq 6\ ^0C$
3. Mercury (in stock Barite)	Polyethylene Bottle 500 mL	Refrigerate $\leq 6\ ^0C$
4. Cadmium (in stock Barite)	Polyethylene Bottle 500 mL	Refrigerate $\leq 6\ ^0C$

Remarks : [1/] BS = British Standard Method

SM = Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017

U.S.EPA = Test Methods Evaluating Solid Waste, Physical/Chemical Methods (SW 846), United States Environmental Protection Agency

3.2.3 Mud, Cutting and Stock Barite Monitoring Results

- **Chloride in Mud and Cuttings**

Refering to analysis report number T20AG851-0001 - T20AG851-0002 and T20A51-0004. Mud and Cuttings were collected by project staff. Both result of Chloride (for WBM) is 0.34 % w/w. The monitoring results was shown in Table 3-5.

Table 3-5 The Results of Chloride in Mud and Cuttings Monitoring

Station	Date	Chloride (for WBM) (%w/w)	Sample Condition
1. SHWE NADI-1,17-1/2" SECTION TD (CUTTING)	February 16, 2020	0.34	grey cutting
Guideline[1/]		-[2/]	-

Remarks : [1/] National Environmental Quality (Emission) Guidelines.

[2/] Maximum Chloride concentration must be less than four time's ambient concentration of fresh of brackish receiving water.

- **Oil on Cuttings (for SBM)**

Refering to analysis report number T20AG851-0003 . Cuttings was collected by project staff. The results found that %OOC (dry weight) is 6.20 %. When compared the results with the Environmental, Health and Safety Guideline for Offshore Oil and Gas Development by IFC 2015 that allowed the OOC below 9.4% for ester base, found that Oil on cuttings was complied with the standard. The analysis result of oil on cutting for MD-7 drilling which used the Ester mud type therefore the standard limit is 9.4% shown in Table 3-6.

The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix G, H and I.

Table 3-6 The Results of Oil on Cuttings in Cuttings Monitoring

Station	Date	Oil on Cuttings (for SBM) %OOC (dry weight)	Sample Condition
1. SHWE NADI-1,12-1/4" SECTION TD (CUTTING)	February 24, 2020	6.20	brown cutting
Guideline[1/]		**9.4**	-

Remark: [1/] Environmental, Health and Safety Guideline for Offshore Oil and Gas Development, IFC 2015.

- **Total Mercury and Total Cadmium in stock barite**

Refering to analysis report number T20A51-0006. Stock Barite was collected by project staff. Total mercury and total cadmium (in stock barite) were analyzed, the results found that total Mercury (in stock barite) is 0.453 mg/kg (dry weight) and total Cadmium (in stock Barite) is ND. When compared the results with National Environmental Quality (Emission) Guidelines found that total mercury and total cadmium (in stock barite) were complied with the standard. The monitoring results as shown in Table 3-7.

The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix G,H and I.

Table 3-7 The Results of Total Mercury and Total Cadmium in Stock Barite Monitoring

Station	Date	Total Mercury (in stock Barite) mg/kg (dry weight)	Total Cadmium (in stock Barite) mg/kg (dry weight)	Sample Condition
1. SHWE NADI-1,17-1/2" SECTION TD (STOCK BARITE)	February 16, 2020	0.453	ND	GREY BARITE
Guideline[2/]		**1**	**3**	**-**

Remark: [2/] National Environmental Quality (Emission) Guidelines.

3.3 Sewage Monitoring

Sewage monitoring at NCB Rig as specified in EMP was conducted by REM-UAE Laboratory and Consultant Company Limited for Exploration Drilling Campaign in Block MD-7 2019 (Drilling Phase) in December 11, 2019 during the rig NCB performed the activity for previous PTTEP drilling campaign. The detail as shown in Table 3-8.

Table 3-8 Sewage Water Quality Monitoring Plan

Environmental Quality	Parameter	Location	Period
Sewage	1. Thermotolerant Coliform Bacteria (FCB) 2. Biochemical Oxygen Demand (BOD) 3. Chemical Oxygen Demand (COD) 4. pH	Sewage Water Treatment System at NCB Rig	December 11, 2019

3.3.1 Sewage Analysis Method

Details of Sewage monitoring including parameters and analysis methods are shown in Table 3-9

Table 3-9 Parameters and Analyses Methods for Sewage water Quality Monitoring

Parameter	Analysis Method[1/]
1. Thermotolerant Coliform Bacteria (FCB)	Multiple Tube Fermentation Technique (SM : 9221 B)
2. Biochemical Oxygen Demand (BOD)	Membrane Electrode Method (SM : 5210 B and 4500-O G)
3. Chemical Oxygen Demand (COD)	Closed Reflux, Titrimetric Method (SM : 5220 C)
4. pH	Electrometric Method at Site (SM : 4500-H^+ B)

Remark: [1/] Based on Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017

3.3.2 Sampling Methods for Sewage water

Sewage water samples were collected at effluent from sewage water treatment system at NCB rig on December 11, 2019 as shown in Figure 3-1.

Figure 3-1 Sewage water Monitoring on December 11, 2019.

3.3.3 Preservation Methods

All samples were preserved with specific procedure and storage as shown in Table 3-10

Table 3-10 Container and Preservation Methods of Sewage water Monitoring

Parameter	Container	Preservation Methods*
1. Thermotolerant Coliform Bacteria (FCB)	Sterile, Brown Glass Bottle 150 mL	Add 10% $Na_2S_2O_3$ 0.1 mL/100 mL and Refrigerate at > 0 ^oC, < 10 ^oC
2. Biochemical Oxygen Demand (BOD)	Polyethylene Bottle 1 L	Refrigerate at > 0 ^oC, ≤ 6 ^oC
3. Chemical Oxygen Demand (COD)	Glass Bottle 250 mL	Add H_2SO_4 to pH < 2 and Refrigerate at > 0 ^oC, ≤ 6 ^oC
4. pH	Glass wide Mouth Bottle 1 L	Add H_2SO_4 to pH < 2 and Refrigerate at > 0 ^oC, ≤ 6 ^oC

Remarks : * Based on Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017

3.3.4 Sewage Monitoring Result

Sewage sample was conducted at NCB rig on December 11, 2019 for of Exploration Drilling Campaign in Block MD-7 2019. The result found that BOD and pH complied with MEPC.159 (55), except COD and Total Coliform Bacteria.

However, the sewage treatment unit has been inspected periodically, the performance of sewage treatment system have to be considered and improved to ensure that all parameters will meet the control limit as per Sewage Pollution Prevention Certificate (Appendix E-2). The sewage water monitoring results are shown in Table 3-10. Table 3-11.

The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix G,H and I.

Table 3-11 Results of Sewage water Monitoring

Parameter	Unit	The Results of Sewage Quality	Guideline Value [1/]	Detection Limit
Date of Sampling	*December 11, 2019*			
1. Thermotolerant Coliform Bacteria (FCB)	MPN/100 mL	160,000	100	1.8
2. Biochemical Oxygen Demand (BOD)	mg/L	19.8	25	2.0
3. Chemical Oxygen Demand (COD)	mg/L	356	125	25
4. pH	-	8.2 (28 °C)	6-8.5	-
Sample Condition				
Water Colour/Turbid	-	Brown/Turbid	-	-
Sediment	-	Brown	-	-

Remark: [1/] Resolution of the Marine Environment Protection Committee MEPC.159(55)

3.4 Hazardous and Non-hazardous Waste Monitoring

Hazardous and Non-hazardous Waste monitoring was conducted for drilling phase were done by PTTEP SA. The detail as shown in Table 3-12

Table 3-12 Quantity of Non-Hazardous Waste and Hazardous Waste Generated During the Project (February - March 2020)

Type of Waste	Quantity of generated waste for drilling (ton)
Non-hazardous waste	16.1
Hazardous waste	4.473

Source: PTTEP SA, 2020

3.5 Public and Occupational Health and Safety Monitoring

Public and occupational health and safety monitoring was conducted for drilling phase were done by PTTEP SA. The detail as shown in Table 3-13.

Table 3-13 Public and Occupational Health and Safety Monitoring Plan

Environmental Quality	Parameter	Location	Period
Public and Occupational Health and Safety	• Accidental statistics cause of accidents	Project area, community around project area, and transportation route	Throughout the project activity.

3.5.1 Public and Occupational Health and Safety Monitoring Methods

PTTEP SA provided SSHE Management System Manual and training program on Safety, Security Health and Environment Management System (SSHE-MS) and other concerned safety standards have been provided to the contractor for follow with the PTTEP SA's plan. Public and Occupational health and safety monitoring was conducted by recording the accident during working time; including causes, accident level, and performed mitigation measures. Monitoring program and report were conducted throughout operation period following the specified measures in EIA report.

3.5.2 Public and Occupational Health and Safety Monitoring Results

Public and occupational health and safety monitoring results for drilling phase were done by PTTEP SA. There was 1 first aid case (FAC) incident but no spillage or leakage occurred during drilling activities. Corrective actions were proposed/implemented to prevent reoccurrence of the incident case (Appendix-C-2).

Chapter 4
Environmental Mitigation Measures Compliance Audit and Environmental Monitoring Conclusion

From the implementation of Environmental Mitigation Measures Compliance Audit and Environmental Monitoring in the drilling phase of Exploration Drilling Campaign in Block MD-7, it was found that the project has implemented the measures as specified in EIA.

Audit and document checking by setting 4 levels of evaluation as follows;

- Completely complied on the Mitigation Measures (✓) refers the project can complete comply with the measure without any barriers.
- Mostly complied on the Mitigation Measures (✓) refers the project can mostly comply with the measure without any barriers.
- Do not complied on the Mitigation Measures (×) refers the project cannot comply with the measure because of some barriers.
- Do not have situation follows the Mitigation Measures (**NA**) refers during the project operations do not have any of situation follow the Mitigation Measures

Although the project does not comply with the mitigation measures, REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions ways. And the results can be summarized as follows.

4.1 Environmental Mitigation Measures Compliance Audit Conclusion

4.1.1 Environmental Mitigation Measures Compliance Result in Drilling Phase

- **Air Quality -** Routine inspection and preventive maintenance for all machinery were conducted as follows routine PM and Inspection Plan which the project used the SAP system to support PM plan.
- **Seawater and Sediment Quality** - WBM and SBM was used by technical reason. The mud circulation system was provided to circulate mud for recycling. Chemical used and discharge of cutting were recorded by the project and discharged at 15 m below sea surface. The quantities of cement and the dosing of chemicals used were optimized by project staffs to minimize waste for discharge. SDS were provided at all chemical storage area of NCB Rig. Low toxicity of chemical was used in this project. And SDS were provided to identify the toxic of chemical. Waste containers were provided at NCB Rig and supply vessel. All waste was collected in garbage bag before discharge in waste containers. Waste containers were covered to protect from the environment. The waste from NCB Rig and vessel was transferred to dispose onshore by authorized contractor. PTTEP SA followed the requirements of MARPOL 73/78 and PTTEP SA' s Waste Management Procedure. The vessel deck was regularly cleaned to minimize the impact from oil and chemical contamination into the sea during period of rain. Crew was prohibited to drop waste into the sea. Food grinder was provided to grind the food waste to 25 mm prior to discharge to sea.

- **Seabed characteristics, Marine Life and Marine Ecology –** PTTEP SA strictly implement and follow mitigation measures for impacts to seawater & sediment quality.
- **Fishing Community / Fisheries** - The project information and drilling plan was already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties 30 days in advance. The project has established 500 m safety zone around the drilling rig.
- **Shipping / Navigation** – The project information and drilling plan was already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties 30 days in advance. The project has established 500 m safety zone around the drilling rig and provided support vessels for warning off traffic and observe fishing and commercial vessels approaching the safety zone to prevent collision. In addition, appropriate lights and warning signals were provided around the NCB Rig and support vessels.

The results determined that the project completely complied on the environmental mitigation measures implementation compliance in Drilling Phase with 100%.

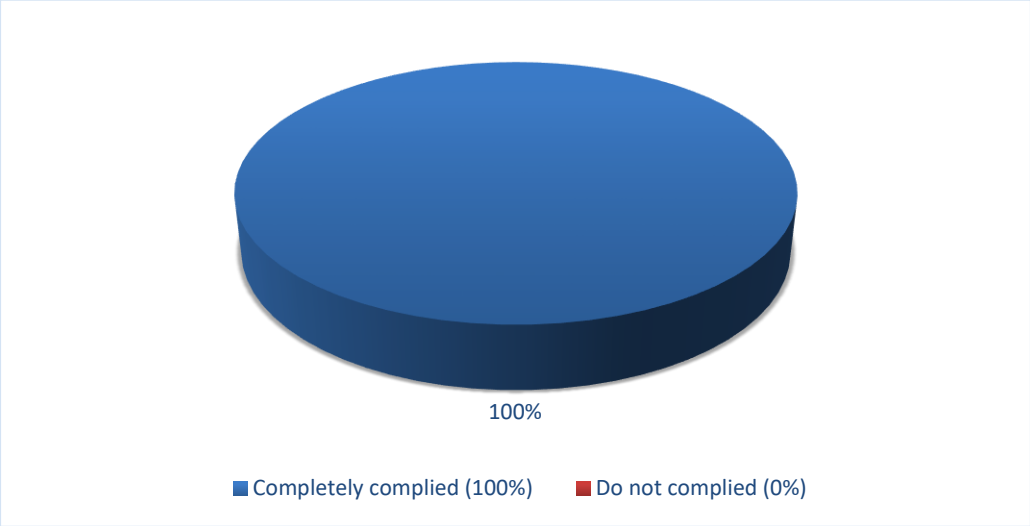


Figure 4-1 The Results of 4.1 Environmental Mitigation Measures (Drilling Phase) Compliance Audit

4.1.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

- **Vessel Collision** - To prevent vessel collision, PTTEP's SSHE Management System was already prepared and enforced all worker and contractor to strictly implemented. The information and drilling plan were already informed to all related organizations before starting of drilling period. MOGE issued Notice to Mariner to concerned parties over 30 days in advance and 500 m safety zone around the drilling rig was established.
- **Accidental Spills** - PTTEP's SSHE Management System were already prepared and enforced the worker and contractor to implement. The project also enforced the worker and contractor to follow all PTTEP's Plan and standard.
  - Prepared spill kits and fire protection equipment within project area
  - Held emergency response drills and exercise. However, there was no emergency situations during drilling activity.
  - Provided separate waste container within project area. Moreover, the project has used waste compactor to compress waste before ship to disposed onshore.
- **Well Blowout** - PTTEP's SSHE Management System were already prepared and enforced the worker and contractor to implement. The project also enforced the worker and contractor to follow all PTTEP's Plan and standard.
  - Regularly check the pressure in drilling well and mud circulation according to PM plan.
  - Tested and certify BOP in accordance with API 53.
  - Prepared spill kits and fire protection equipment within project area
  - Held emergency response drills and exercise. However, there was no emergency situations during drilling activity.
- **Fire or Explosion** - The project has provided fire protection equipment and manual and lifesaving equipment within project area. Moreover, the project has provided Emergency and Crisis Management Plan and held emergency response drills and exercise. However, there was no emergency situations during drilling activity.

The results determined that the project completely complied on the environmental mitigation measures implementation compliance in unplanned event with 100%.

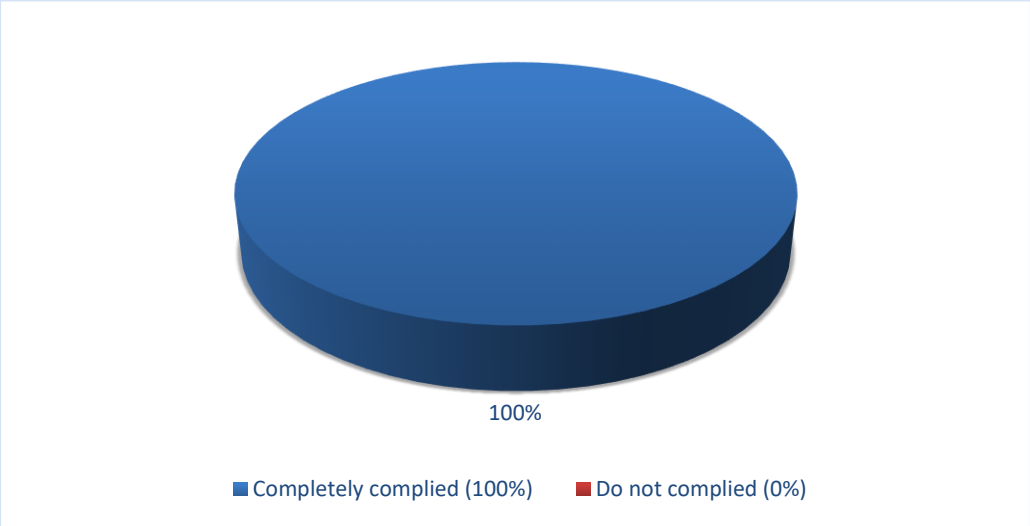


Figure 4-2 The Results of 4.1 Environmental Mitigation Measures (Unplanned Events) Compliance Audit

4.2 Environmental Monitoring Conclusion

4.2.1 Mud, Cutting and Stock Barite Monitoring

- **Chloride in Mud and Cuttings**
  Mud and Cuttings were collected by project staff in February, 2020 in drilling phase. Both result of Chloride (for WBM) is 0.34 % w/w. According to National Environmental Quality (Emission) Guidelines maximum chloride concentration must be less than four time's ambient concentration of fresh of brackish receiving water.
- **Oil on Cuttings (for SBM)**
  Cuttings sample were collected by project staff in February, 2020 in drilling phase. The results found that %OOC (dry weight) was 6.20 %. When compared the results with the Environmental, Health and Safety Guideline for Offshore Oil and Gas Development by IFC 2015 that allowed the OOC below 9.4% for ester base, found that Oil on Cuttings of sample was complied with the standard.
- **Total Mercury and Total Cadmium in Stock Barite**
  Stock Barite was collected by project staff in February 2020 in drilling phase The results found that total Mercury (in stock barite) is 0.453 mg/kg (dry weight) and total Cadmium (in stock Barite) is ND. When compared the results with National Environmental Quality (Emission) Guidelines found that Mercury and Cadmium (in stock barite) are complied with the standard.

4.2.2 Sewage Monitoring

Sewage monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on December 11, 2019 from sewage treatment system discharge point at NCB Rig. The result found that Thermo tolerant Coliform Bacteria (FCB), BOD, COD and pH were 160,000 MPN/100ml, 19.8 mg/L, 356 mg/L and 8.2 respectively. When compared sewage monitoring results with Resolution of the Marine Environment Protection Committee MEPC.159 (55) found that Thermo tolerant Coliform Bacteria (FCB) and COD were not complied with MEPC.159 (55). The performance of sewage treatment system has to be considered and improved to ensure that all parameters will meet the control limit as per Sewage Pollution Prevention Certificate.

4.2.3 Hazardous and Non-hazardous Waste Monitoring

Hazardous and Non-hazardous Waste monitoring was conducted for drilling phase were done by PTTEP SA. The total amount of Hazardous Waste during drilling phase is 4.473 ton while the total amount of Non-hazardous Waste is 16.1 ton.

4.2.4 Occupational Health Management Monitoring

PTTEP SA provided SSHE Management System Manual and training program on Safety, Security Health and Environment Management System (SSHE-MS) and other concerned safety standards have been provided to the contractor for follow with the PTTEP SA's plan. Public and

Occupational health and safety monitoring was conducted by recording the accident during working time; including causes, accident level, and performed mitigation measures. Monitoring program and report were conducted throughout operation period following the specified measures in EIA report. There was 1 first aid case (FAC) incident but there was no spillage or leakage occurred during drilling activities. Corrective actions were proposed/implemented to prevent reoccurrence of the incident case.

The results of Environmental Monitoring determined that the project completely complied with 100% as shown in Figure 4-3.

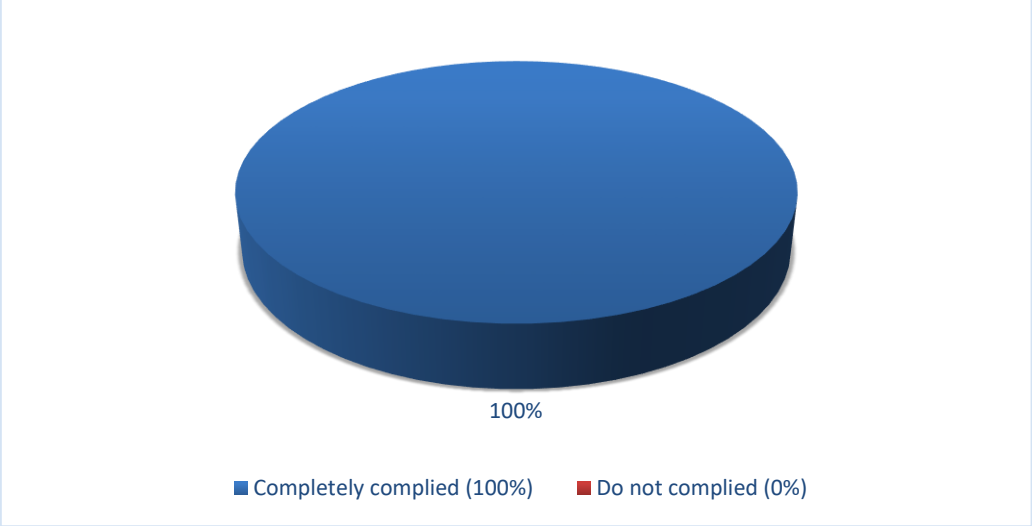


Figure 4-3 the Results of Environmental Monitoring