



Monitoring Report of Zawtika Phase 1C and 1D Development in Block M9 during July – December 2020



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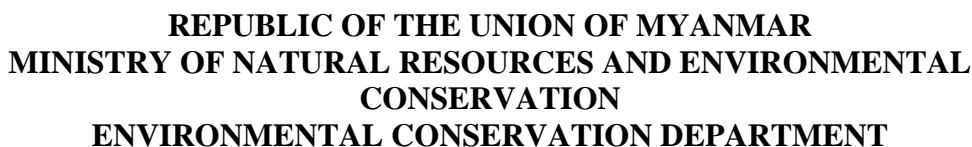


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This is the official submission form of Monitoring Report under *Environmental Impact Assessment Procedure Notification No.616/2015*. This form shall be completed in its entirety and submitted to the Environmental Conservation Department, Ministry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

Proponent Name:	PTTEP International Limited		Company Registration Number by DICA (if any):	84 FC
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Project Title	Zawtika Development Phase of 1C and 1D
Project Location (Address)	Offshore Block M9, Gulf of Martaban, Andaman Sea
ECC number	

[illegible]

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)

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):

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အစီရင်ခံစာအကျဉ်းချုပ်

REM-UAE ဓာတ်ခွဲခန်းနှင့်အကြံပေးကုမ္ပဏီလီမိတက်သည် ဇောတိကဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်း အဆင့် 1C နှင့် 1D အတွက် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးရေး အစီအမံများနှင့် စောင့်ကြည့်စစ်ဆေးရေး အစီအစဉ် အကောင်အထည်ဖော်ခြင်းအား လိုက်နာဆောင်ရွက်ခြင်းအခြေအနေစစ်ဆေးခြင်းကို ပြုလုပ်ခဲ့သည်။

အကဲဖြတ်ခြင်း၏ ရည်ရွယ်ချက်မှာ EIA အစီအရင်ခံစာတွင် ဖော်ပြထားသည့်အတိုင်း ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှု လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်းအစီအစဉ်၏ ထိရောက်မှုအခြေအနေကို အကဲဖြတ်ဆန်းစစ်ရန် ဖြစ်ပါသည်။ အစီရင်ခံစာတွင် ဖြစ်ပေါ်နိုင်ခြေရှိသောပြဿနာများ (သို့မဟုတ်) အခက်အခဲများပါရှိ၍ အစီရင်ခံစာမှနေ၍ ထိခိုက်မှုတားဆီးခြင်းနှင့် လျော့ပါးရေးအစီအမံများ ထိရောက်မှု ရှိစေရန်အတွက် အကြံပြုချက်များကို အဆိုပြုထားပါသည်။

အကဲဖြတ်ခြင်းဖြစ်စဉ်တွင် (၁) စာရွက်စာတမ်းများအကဲဖြတ်ခြင်း (၂) နမူနာစုဆောင်းခြင်းနှင့်ခွဲခြမ်းစိတ်ဖြာခြင်း နှင့် (၃) PTTEP အဖွဲ့မှနေ၍ စီမံကိန်းဆိုင်ရာဓာတ်ပုံများကို REM-UAE သို့ ထောက်ပံ့ပေးခြင်းတို့ ပါဝင် ပါသည်။

၁။ စီမံကိန်း အကြောင်းအရာ

PTT အပြည်ပြည်ဆိုင်ရာရှာဖွေရေးနှင့် ထုတ်လုပ်မှုလီမိတက် (PTTEPI) သည် လုပ်ကွက် M9 နှင့် M11 တို့အတွက် ထုတ်လုပ်မှုအပေါ်မျှဝေခံစားခြင်းစာချုပ် (PSC) ကို မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း (MOGE) နှင့် ၂၀၀၃ ခုနှစ် နိုဝင်ဘာ ၁၂ ရက် နှင့် ၂၀၀၅ ခုနှစ် ဇူလိုင်လ ၂၅ ရက်နေ့တို့တွင် အသီးသီး လက်မှတ်ရေးထိုးခဲ့ပါသည်။

ကန်ထရိုက်စာချုပ်နယ်မြေ (သို့မဟုတ်) ဖွံ့ဖြိုးရေးနှင့်ထုတ်လုပ်မှုဧရိယာသည် လုပ်ကွက် M9 တစ်ခုလုံးနှင့် M11 ၏ အရှေ့မြောက်ဘက်နေရာအစိတ်အပိုင်းအနည်းငယ်ဖြစ်ပါသည်။ ပို့ကုန်ဓာတ်ငွေ့ရောင်းချမှုသဘောတူညီချက် (EGSA) နှင့် ပြည်တွင်းသဘာဝဓာတ်ငွေ့အရောင်း သဘောတူညီချက် (DGSA)၊ M9 နှင့် M11 ရှိ သဘာဝဓာတ်ငွေ့ဆိုင်ရာ နောက်ဆက်တွဲသဘောတူညီချက် (SAGT)၊ ပို့ကုန်ဓာတ် ငွေ့သယ်ယူ ပို့ဆောင်ရေး သဘောတူညီချက် (EGTA)၊ နှင့် ပိုက်လိုင်းဆိုင်ရာအခွင့်အရေးသဘောတူညီချက် (PRA) အပါအဝင် ဆက်စပ်သဘော တူညီချက်များကို ၂၀၁၀ ဇူလိုင်လ ၃၀ ရက်နေ့တွင် လက်မှတ်ရေးထိုးခဲ့ပါသည်။ ယေဘုယျနေ့စဉ်စာချုပ်ချုပ်ဆိုနိုင်သော ပမာဏ (DCQ) ကို 300 MMSCFD တွင် သဘောတူညီထားပြီး ထိုင်းနိုင်ငံသို့တင်ပို့မည့်ဓာတ်ငွေ့ပမာဏမှာ 240 MMSCFD ဖြစ်ပြီး ပြည်တွင်းဓာတ်ငွေ့ဈေးကွက်အတွက် 60 MMSCFD ဖြစ်ပါသည်။ 15% swing ဖြင့် ယေဘုယျနေ့စဉ် စာချုပ်ချုပ် ဆိုနိုင်သောပမာဏ (CDC) ကို 345 MMSCFD ကိုရရှိရန် ထားရှိပြီး ထိုင်းနိုင်ငံသို့တင်ပို့မည့်ပမာဏနှင့် ပြည်တွင်းဓာတ်ငွေ့ဈေးကွက်အတွက်လည်း အလားတူအချိုးအစားပမာဏထားရှိပါသည်။

၂။ ဇောတိကထုတ်လုပ်ရေးဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်း

၂၀၁၆ ခုနှစ် ဇောတိကလုပ်ငန်းဧရိယာဖွံ့ဖြိုးတိုးတက်မှုအစီအစဉ်အပေါ်အခြေခံ၍ ဇောတိက ဖွံ့ဖြိုးရေးလုပ်ငန်း စီမံကိန်းကို 1A၊ 1B၊ 1C နှင့် 1D ဟူ၍ အဆင့် ၄ ဆင့်ပိုင်းခြားထားပါသည်။ အဆင့် 1A၊ 1B နှင့် 1C များကို လုပ်ဆောင်ပြီးဖြစ်ပြီး လုပ်ငန်းများလည်း လက်ရှိလည်ပတ်နေပြီဖြစ်ပြီး အဆင့် 1D အတွက်လုပ်ဆောင်မည့် ဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်း အစီအစဉ်များကိုလည်း စီစဉ်ထားပါသည်။

၂.၁ လုပ်ငန်းအဆင့် 1C

- ZWP8၊ ZWP9၊ ZWP10 နှင့် ZWP11 စသည့် ကမ်းလွန်တွင်း wellhead platforms (၄) ခုပါဝင်ပါသည်။ တွင်း (၄) ခုမှ တွင်းရည်များကို ZPQ ထံသို့ တွင်းကြား ဆက်သွယ်ရေး ပိုက်လိုင်း များဖြင့် ပို့ဆောင်သွားပါမည်။
- တွင်းကြားဆက်သွယ်ရေးပိုက်လိုင်း (၄) ခုမှာ -
 - ZWP8 to IP2 PLEM (18" 22.5 km)
 - ZWP9 to ZWP7 (14" 11 km)
 - ZWP10 to IP2 PLEM (18" 5 km)
 - ZWP11 to IP6PLEM (18" 15 km) တို့ဖြစ်ကြပါသည်။
- ပိုက်လိုင်းအဆုံး Manifolds (PLEMs) (၂) ခုမှာ -
 - IP2 PLEM: 3-inlet subsea PLEM (for IP2, IP8 and IP10)
 - IP6 PLEM: 4-inlet subsea PLEM (for IP6, IP11 and 2 future tie-in) တို့ဖြစ်ပါသည်။
- ပထမဆုံး wellhead platform ကို ၂၀၁၇ ခုနှစ် စတုတ္ထလပတ် (Q4) တွင် တပ်ဆင်ခဲ့ပြီး wellhead platform အားလုံး၊ ဆက်စပ်ပိုက်လိုင်းများ နှင့် PLEM များကို ၂၀၁၈ခုနှစ် ဒုတိယလပတ်(Q2)တွင် တပ်ဆင်ပြီးစီးခဲ့ပါသည်။
- ဇောတိကထုတ်လုပ်မှုလုပ်ငန်းအဆင့် 1C ကို ၂၀၁၈ခုနှစ် နိုဝင်ဘာလဝန်းကျင်တွင် စတင်ခဲ့ပါသည်။

၂.၂ လုပ်ငန်းအဆင့် 1D

- ZWP12၊ ZWP13၊ ZWP14၊ ZWP15၊ ZWP16၊ ZWP17၊ ZWP18 နှင့် ZWP19 စသည့် ကမ်းလွန်တွင်း wellhead platform (၈) ခုပါဝင်ပါသည်။ ပိုက်လိုင်းအဆုံး manifold (PLEM) 2 ခုအပါအဝင် ဆက်စပ်ပိုက်လိုင်း များလည်း ပါဝင်ပါသည်။
- Wellhead platform များတပ်ဆင်ခြင်းအတွက် ကွင်းဆင်းအကောင်အထည်ဖော်ဆောင်ရွက်မှုများ ကို ၂၀၂၂ခုနှစ် ဒုတိယလပတ် (Q2) တွင် စတင်သွားပါမည်။

၃။ လုပ်ငန်းလုပ်ဆောင်ပုံစနစ်

ကမ်းလွန် Wellhead platform များမှ တွင်းရည်များ ZPQထဲသို့ စီးဝင်ခြင်းဖြင့် လုပ်ငန်းစနစ်စတင်သည်။ ၎င်းတို့ကို ပင်လယ်ရေဖြင့် အအေးခံပြီး ပင်လယ်ရေအပူချိန် အထက်အနည်းငယ်ပိုသော အပူချိန်သို့ ရောက်ရှိစေသည်။ Wellhead Platform (WP1) ကို ဆက်သွယ်ထားသော bridge မှ တွင်းရည် (well fluid) များကို အခြား တွင်းရည်များနှင့် မရောနှောမီတွင် (လေအေးပေးခြင်းစနစ်ဖြင့်) အအေးခံပါသည်။

ထို့နောက် ဝင်လာသောတွင်းရည်များကို ထုတ်လုပ်ရေးဆိုင်ရာခွဲထုတ်စက်များ (Production Separator) မှ ဖြတ်၍ ၎င်းတို့ကို ဓာတ်ငွေ့ condensate (ငွေ့ရည်) နှင့် ရေစီးကြောင်းများအဖြစ် ခွဲခြားသည်။ Separator မှ ထွက်လာသော ဓာတ်ငွေ့များကို ပထမအဆင့် ဓာတ်ငွေ့ကွန်ပရက်ဆာဖြင့် ပါဝင်လာသော ငွေ့ရည်များကို ဖိနှိပ် ဖယ်ရှားပြီးနောက် ဓာတ်ငွေ့မှရေဖယ်ရှားခြင်းပြုလုပ်ရန် ပို့ဆောင်ပါသည်။ ရေဖယ်ရှားရေးယူနစ်မှ ထွက်လာ သော ခြောက်သွေ့သောဓာတ်ငွေ့များကို အအေးခံ၍ ဒုတိယအဆင့် ကွန်ပရက်ဆာတွင် ဖိနှိပ်သိပ်သည်းစေပြီး ၂၈ လက်မအချင်းရှိသော ကမ်းလွန်ပို့ကုန်ဓာတ်ငွေ့ပိုက်လိုင်းဖြင့် ကုန်းတွင်းပိုင်းလုပ်ငန်းနေရာသို့ပို့ဆောင်ပါသည်။ ခြောက်သွေ့သောဓာတ်ငွေ့အချို့ကို အခြားလုပ်ငန်းများ နှင့် ZPQအတွက် စွမ်းအင်ထောက်ပံ့ရန် ထုတ်လုပ်မှု အတွက်လောင်စာအဖြစ်အသုံးပြုပါသည်။

ဓာတ်ငွေ့မှ ခွဲထုတ်လိုက်သော ထုတ်လုပ်အရည်များတွင် ငွေ့ရည် (condensate) နှင့် ထွက်ရှိလာသော ရေ တို့ပါ ဝင်ပါသည်။ ငွေ့ရည် (condensate) ကို WP1 ရှိ မီးခိုးမထွက်သောလောင်ကျွမ်းစေသည့်စက် (smokeless burner)ကို အသုံးပြု၍ လောင်ကျွမ်းစေပါသည်။

ထွက်ရှိလာသောရေတွင် Hg၊ ဓာတ်ငွေ့မှ As စသည့် လေးလံသတ္တု (heavy metal) များမပါရှိပါ။ ရှာဖွေမှု ဧရိယာ တိုင်းအ တွက် ရေစမ်းသပ်မှုကို ပြုလုပ်ပါသည်။ PTTEPI သည် ၎င်းတို့၏လုပ်ငန်းလည်ပတ်ချိန်မှစ၍ ထွက်ရှိ သောရေခွဲခြမ်း စိတ်ဖြာမှုများကို လစဉ်ပြုလုပ်ခဲ့ပြီး လေးလံသောသတ္တုများ မတွေ့ရှိရပါ။ ထို့ကြောင့် ထုတ်လုပ် ရေးဆိုင်ရာခွဲထုတ်ရေးစက် (production separator) မှ ခွဲထုတ်လိုက်ပြီး ထွက်ရှိလာသောရေများ နှင့် condensate flash drum ၏ အမြင့်ဆုံးဒီဇိုင်း 20,000 bpd မှ ရေအချို့ကို ဆီပြန်လည်ခွဲထုတ်ရေးစက် (de-oiler unit) သို့ ပို့ပြီး လက်ကျန်ငွေ့ရည်များကိုခွဲထုတ်ပြီး flash drum သို့ပြန်လည်ပို့စေသည်။ ထို့နောက် မြန်မာ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေးလမ်းညွှန်ချက်စံညွှန်း (EQEG) နှင့်ညီအောင်ပြုလုပ်၍ ရေထဲသို့စွန့် ပစ်သည်။

၄။ ထုတ်လွှတ်မှုများနှင့်စွန့်ထုတ်မှုများစီမံခန့်ခွဲမှု

၄.၁ မီးတောက်

ZPQ သည်ထုတ်လုပ်မှုစက်ရုံများမှ ဟိုက်ဒရိုကာဘွန်ဓာတ်ငွေ့များ စီစဉ်ထားသည့်အတိုင်း ထွက်ရှိမှုနှင့် မမျှော်လင့်ဘဲ ထွက်ရှိလာမှုများအတွက် ဘေးကင်း၍ စိတ်ချရသော HP နှင့် LP ဓာတ်ငွေ့မီးတောက်စနစ်များ တပ်ဆင်ထားသည်။ HP နှင့် LP စနစ်များတွင် Flare knock out drum များ တပ်ဆင်ထားသည်။ ပမာဏ ထိန်းချုပ် စီစဉ်ထားရှိမှုအနေဖြင့် အရည်များအဆက်မပြတ် မထွက်ရှိနိုင်သဖြင့် အပိတ်/အဖွင့် (on/off) ဓာတ်ငွေ့ပမာဏထိန်းချုပ်မှုစနစ် ဖြစ်ပါသည်။ ပုံမှန်အရည်ပမာဏကို liquid relief အတွက်

နေရာအများဆုံးဖြစ်စေရန် နှင့် liquid knock out တိုးတက်မှုရှိစေရန် ဓာတ်ငွေ့ဧရိယာကို အများဆုံးဖြစ်ရန် တတ်နိုင်သမျှနိမ့်ကျအောင် ထိန်းချုပ်ထားသည်။ HP နှင့် LP flare knock out drum နှစ်ခုစလုံးမှ အရည်များကို အလုံပိတ်ထားသော drain vessel ထဲတွင်စုဆောင်းသည်။

Wellhead platform (WP1 –WP11) အားလုံးတွင် ယာယီ (ရွှေ့ပြောင်းနိုင်သောပုံစံ) flare boom နှင့် တွင်းသန့်စင်မှုအတွက် ဓာတ်ငွေ့-အရည်လောင်ကျွမ်းစေသောစက် (၁) ခုတို့ကို တပ်ဆင်ထားပါသည်။ Tie-in အမှတ် (၂) ခု (Platform၏ အရှေ့ဘက် တွင် (၁) မှတ် နှင့် အနောက်ဘက်တွင် (၁) မှတ်) WP အားလုံးရှိ ယာယီ လောင်ကျွမ်းစက်အတွက် ထားရှိပေးထားပါသည်။

၄.၂ စွန့်ပစ်ပစ္စည်းနှင့်စွန့်ပစ်ရေ

စီမံကိန်းလှုပ်ရှားမှုများမှထွက်ရှိလာသောစွန့်ပစ်ပစ္စည်းများကို အန္တရာယ်ရှိမှုအခြေအနေအရ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်း နှင့် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းအဖြစ် အဓိကအမျိုးအစား (၂)ခုခွဲခြားပါမည်။

၅။ အများဆိုင်ရာအသုံးချနေရာများ

၅.၁ လျှပ်စစ်နှင့်စွမ်းအင်အသုံးချမှု

ZPQ ကို လောင်စာမျိုးသုံး ဓာတ်ငွေ့တာဘိုင်စွမ်းအင်ထုတ်လုပ်မှုယူနစ် (၃) ခု (တစ်ခုလျှင် 3.7 MW စွမ်းရည်ရှိ) ကို ZPQ နှင့် WP1 အတွက် လိုအပ်သောစွမ်းအင်အားလုံးကိုထောက်ပံ့ရန် တပ်ဆင်ထားပါသည်။ အကယ်၍ ယူနစ်တစ်ခုခုမှ လည်ပတ်နိုင်စွမ်းမရှိသောအခါအသုံးပြုနိုင်ရန် ဘက်စုံသုံးဓာတ်ငွေ့တာဘိုင် မောင်းနှင်ယူနစ် များကိုလည်း တပ်ဆင်ပေးထားပါသည်။

စွမ်းအင်(၃)မျိုးသုံး (ဓာတ်ငွေ့၊ ငွေ့ရည် နှင့် ဒီဇယ်)ပုံစံကို စွမ်းအင်ထုတ်လုပ်ရေးယူနစ် (၃) ခုလုံးအတွက် ရွေးချယ်ထားပါသည်။ သို့သော် ဆက်သွယ်မှုကိုမူ ဓာတ်ငွေ့လောင်စာနှင့် ဒီဇယ်အတွက်သာထားရှိ ထားပါသည်။ လျှပ်စစ်မော်တာသုံးစတင်စနစ်များကို စွမ်းအင်ထုတ်လုပ်ရေးမီးစက် ၃ခုလုံးအတွက် တပ်ဆင်ပေးထားပါသည်။

အရေးပေါ်ဒီဇယ်သုံးစွမ်းအင် 1.28 MW ထုတ်လုပ်မှုကို အကယ်၍ တာဘိုင်မီးစက် trip ဖြစ်ခဲ့ပါက မရှိမဖြစ် သုံး ရန် ထားရှိ ပေးထားပါသည်။ 280 kW ရှိသော black start diesel generator တစ်ခုကိုလည်း စတင် စနစ်အတွက် ထောက်ပံ့ပေးထားပါသည်။

၅.၂ ရေအသုံးချမှု

တစ်ခုလျှင် 1.5 m³/hr စွမ်းရည် (စုစုပေါင်း 3 m³/hr) ရှိသော Reverse osmosis စနစ်သုံး ရေထုတ်လုပ်ရေးယူနစ် (၂)ခုကို RO အလွှာကိုအသုံးပြုပြီး ရေချိုထုတ်လုပ်ပါသည်။ ယင်းယူနစ်များမှ ထုတ်လုပ်လိုက်သောရေသည် အသုံးချဖို့သင့်လျော်ပါသည်။ ထို့အပြင် မျက်လုံးဆေးခြင်း၊ ဘေးကင်းလုံခြုံရေးဆိုင်ရာရေချိုးခြင်း အစရှိသည့် ပုံမှန်မဟုတ်သော အသုံးချမှုများ အတွက် လည်းသင့်တော်ပါသည်။ ရေချိုထုတ်လုပ်ရေး ယူနစ်များမှ ထွက်ရှိလာသော ရေချိုများကို

ရေချိုသိုလှောင်ကန်များထဲတွင် စုဆောင်းပါသည်။ သောက်ရန်အတွက် သင့်တော်သော သောက်ရေကို သန့်စင်ပစ္စည်း(sterilizer)ဖြင့် သန့်စင်ပြီးသည့်နောက် တွင် ထောက်ပံ့ပေးပါသည်။

၆။ အရေးပေါ်ရပ်တန့်မှုစနစ်

ZPQ ကို လုံးဝ အလိုလျောက်ဖြစ်သော၊ စနစ်များစုပေါင်းတပ်ဆင်ထားသော၊ ဗဟိုထိန်းချုပ်မှုရှိသော ပလက်ဖောင်း/စနစ် ထိန်းချုပ်မှုကို ထောက်ပံ့ပေးနိုင်ရန် ပုံစံရေးဆွဲထားပါသည်။ ထိန်းချုပ်ခန်း တာဝန်ရှိသူသည် Process Control System (PCS)၊ လုံခြုံရေးကိရိယာစနစ် နှင့် ZPQရှိ စက်များအတွက် မီးနှင့်ဓာတ်ငွေ့စနစ် (SIS နှင့် FGS)၊ Wellhead platform နှင့် ကမ်းလွန် Wellhead platform များကိုဆက်သွယ်ထားသော Bridge တို့မှတစ်ဆင့် ဖြစ်စဉ်အတွင်းမှ ပြဿနာများကို စောင့်ကြည့်ခြင်း၊ စစ်ဆေးခြင်း နှင့် ဖြေရှင်းခြင်းတို့ ပြုလုပ်နိုင်ပါသည်။

ZPQ တစ်စိတ်တစ်ပိုင်းအလိုအလျောက် စတင်မှုအစီအစဉ်များနှင့် အလိုအလျောက် လုံခြုံရေးရပ်တန့်မှုများကို ထိန်းချုပ်စနစ်တွင် တပ်ဆင်ထားပါသည်။ စီစီတီစီ စောင့်ကြည့်စစ်ဆေးရေးမော်နီတာများကိုလည်း အရေးကြီးသော လုပ်ငန်းစဉ် ကိရိယာ/စနစ်များကို စောင့်ကြည့်စစ်ဆေးရန်အတွက် ထိန်းချုပ်ခန်းထဲတွင် တပ်ဆင်ထားပါသည်။ အွန်လိုင်းစနစ်သုံး ခွဲခြမ်းစိတ်ဖြာရေးစက်များကိုလည်း feed/sales ဓာတ်ငွေ့ပါဝင်မှုကို စောင့်ကြည့်စစ်ဆေးရန် တပ်ဆင်ထားပါသည်။

၇။ စီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာ၊ လူမှုရေးဆိုင်ရာ နှင့် ကျန်းမာရေးဆိုင်ရာ မူဝါဒများ

PTTEPI စီမံခန့်ခွဲမှုသည် ဘေးကင်းလုံခြုံစိတ်ချရပြီး ကျန်းမာရေးနှင့်ညီညွတ်သောအလုပ်ခွင်တစ်ခုရရှိရန်နှင့် ပတ်ဝန်းကျင်ကို ကာကွယ်သည့်နည်းလမ်းဖြင့် လုပ်ငန်းလည်ပတ်မှုကို အပြည့်အဝကတိပြုသည်။ ဤကတိကဝတ်များ သည် PTTEP ၏ ကော်ပိုရိတ် မျှော်မှန်းချက်၊ ရည်မှန်းချက်၊ တန်ဖိုးထားမှုများ နှင့် PTTEPI SSHE မူဝါဒနှင့် အညီဖြစ်သည်။ ဝန်ထမ်းများ၊ ကန်ထရိုက်တာများနှင့် တတိယအဖွဲ့အစည်းဝန်ထမ်းများ အားလုံးထံမှ နေ၍ တက်ကြွသော တစ်ဦးချင်းပါဝင်မှု၊ တာဝန်ယူမှုနှင့်တာဝန်ခံမှုများကို မျှော်လင့်ပါသည်။ PTTEPI SSHE စီမံခန့်ခွဲမှုစနစ် (SSHE MS)ကို သက်ဆိုင်သူများ အားလုံး၏ ဤအခြေခံမူများရရှိရန် ကြိုးပမ်းအားထုတ်မှုများ နှင့် လျော်ညီအောင် ပုံစံရေးဆွဲထားပါသည်။

PTTEPI ရှိ လိုင်းစီမံခန့်ခွဲမှုအဆင့်အားလုံးသည် ၎င်း၏ SSHE မူဝါဒနှင့် SSHE MS ကိုအကောင်အထည်ဖော်ရန်နှင့် စောင့်စည်းထိန်းသိမ်းရန်အတွက်တာဝန်ရှိပါသည်။ စာရွက်စာတမ်းများကို ပုံမှန်အချိန် အပိုင်းအခြားကာလများအတိုင်း ပြန်လည်အကဲဖြတ်ခြင်းနှင့် ပြန်လည်ပြင်ဆင်ခြင်းပါသည်။

၈။ လိုက်နာဆောင်ရွက်မှုအခြေအနေ

ရလဒ်များအရ စီမံကိန်းသည် ထုတ်လုပ်မှုအဆင့်တွင် ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ပါးစေရေး အစီအမံများ အား ၁၀၀ရာခိုင်နှုန်းလို က်နာဆောင်ရွက်မှုရှိခြင်း နှင့် မျှော်မှန်းမထားသောဖြစ်ရပ်များအတွက် အခြေအနေရှိသော ကိစ္စများ အတွက် ၁၀၀ရာခိုင်နှုန်း လိုက်နာခြင်းရှိသည်။

PTTEPI သည် EIA တွင်ဖော်ပြထားသော ထိခိုက်မှုလျော့ပါးသက်သာရေးအစီအမံများ၏ အများစုကို လိုက်နာခဲ့သည်။ အဓိကကိစ္စရပ်များကို အောက်တွင်အကျဉ်းချုပ်ဖော်ပြထားပါသည်။

၈.၁ ထုတ်လုပ်ရေး/လုပ်ငန်းလည်ပတ်ရေးအဆင့်တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးရေး အစီအမံများ လိုက်နာဆောင်ရွက်မှုရလဒ်များ

- **လေထုအရည်အသွေး** - စက်ယန္တရားအားလုံးအတွက် ပုံမှန်စစ်ဆေးခြင်းနှင့် ကြိုတင်ထိန်းသိမ်းကာ ကွယ်ခြင်း ကို နှစ်စဉ် PM နှင့် စုံစမ်းစစ်ဆေးခြင်းအစီအစဉ်နှင့်အညီ ဆောင်ရွက်ခဲ့ပါသည်။ နှစ်စဉ် ညစ်ညမ်းပစ္စည်းထုတ်လွှတ်မှု အချက်အလက်များအတွက် လစဉ်မှတ်တမ်းတင်ရေးသွင်းထားပါသည်။ ထို့အပြင် Venting နှင့် Flare ကိုလည်း Vent and Drain Philosophy နှင့် HP and LP Flare System Startup စနစ်တို့ဖြင့် ဆောင်ရွက်ပါသည်။ မီးတောက်အသုံးပြုဖြစ်ရပ်များအားလုံးအတွက် အသုံးပြုရသော ဓာတ်ငွေ့ပမာဏကို စီမံကိန်းဝန်ထမ်းမှနေ၍ မှတ်တမ်းတင်ထားပါသည်။
- **ပင်လယ်ရေ နှင့် နံ့အနည်အနှစ်အရည်အသွေး** - စီမံကိန်းတွင် ထောက်ပံ့ရေးလုပ်ငန်းများအတွက် ရေယာဉ် ၂ စီးရှိပြီး ၂စီးစလုံးသည် MARPOL 73/78၏ သတ်မှတ်ချက်များနှင့် ကိုက်ညီပါသည်။ ဆီဖြင့် ညစ်ညမ်းနေသောစွန့်ပစ်ရေများကို drum ပုံးများထဲတွင် သိုလှောင်ထားပြီး စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုဝန်ဆောင်မှုလိုင်စင်ရထားသော ကုန်းတွင်းရှိကန်ထရိုက်တာထံသို့ ပို့ဆောင်၍ စွန့်ပစ်စေပါသည်။ ပုံးများထားရာ ကုန်းပတ်နေရာကို ဆီများ၊ ဓာတုပစ္စည်းများ မိုးရေထဲတွင် ညစ်ညမ်းမှုများမဖြစ်စေရန် ဝန်ထမ်းများဖြင့်ပုံမှန်သန့်ရှင်းရေးပြုလုပ်ပါသည်။ အရေးပေါ်ဖိတ်စင်မှု တုန့်ပြန်ရေးကိရိယာကိုလည်း ဆီနှင့် ဓာတုပစ္စည်းများထားရာနေရာတိုင်းတွင် ထားရှိပါသည်။ အသုံးပြုပြီးနောက်တွင် ပစ္စည်းများ အားလုံးကို အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများထည့်သည့်ပုံးများထဲတွင် သိမ်းဆည်းသိုလှောင်၍ မြန်မာနိုင်ငံ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုဝန်ဆောင်မှုလိုင်စင်ရထားသော DOWA သို့ပို့ဆောင်၍ စွန့်ပစ်ပါသည်။
- **အဏ္ဏဝါသက်ရှိများနှင့်အဏ္ဏဝါဂေဟဗေဒ** - မိလ္လာရေများကို ရေသန့်စင်စနစ်တွင်သန့်စင်ရန်အတွက် စုဆောင်း၍ ပါရာမီတာအညွှန်းကိန်းများကို MARPOL 73/78 နှင့် Myanmar's EQEG မှ သတ်မှတ်ချက်များနှင့်ကိုက်ညီမှုရှိအောင် စောင့်ကြည့်စစ်ဆေးပါသည်။ ရေသန့်စင်မှုစနစ်ရှိ ကိရိယာများအားလုံးကို နှစ်စဉ် PM နှင့် Inspection Plan အစီအစဉ်များအတိုင်း ပုံမှန်စစ်ဆေးပါသည်။

ထွက်ရှိလာသောရေများကို စုဆောင်း၍ ZPQ တွင် ပြန်လည်သန့်စင်စေပြီး Myanmar's EQEG၏ သတ်မှတ်ချက်အတိုင်း TOG တန်ဖိုးကို ထိန်းချုပ်ထားရန် နေ့စဉ်စောင့်ကြည့်စစ်ဆေးပါသည်။ ထွက်ရှိလာသော သဲများကို ကွန်တိန်နာပုံးများထဲတွင်စုစည်း၍ မြန်မာနိုင်ငံ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုဝန်ဆောင်မှုလိုင်စင်ရထားသော DOWA သို့ပို့ဆောင်၍ စွန့်ပစ်ပါသည်။

အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို အနီရောင် သီးခြား ကွန်တိန်နာပုံးထဲတွင်လည်းကောင်း၊ အထွေထွေ စွန့်ပစ်ပစ္စည်းများကို အပြာရောင်ပုံးများထဲတွင်လည်းကောင်းထည့်၍ ကုန်းတွင်းပိုင်းသို့ ပို့ဆောင်ကာ စွန့်ပစ်စေပါသည်။ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများစွန့်ပစ်မှု အချက်အလက်များကို မှတ်တမ်းတင် သိမ်းဆည်းထားပါသည်။

ထို့အပြင် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းများကို စားကြွင်းစားကျန်များ၊ စက္ကူများ၊ ပြန်လည် အသုံးပြုနိုင်သော စွန့်ပစ်ပစ္စည်းများ နှင့် အခြားအမျိုးအစားများ စသည်ဖြင့် ခွဲခြားထားပြီး အရောင် အသီးသီး သတ်မှတ်ထားသောပုံးများ ထဲတွင် စွန့်ပစ်စေပါသည်။ စားကြွင်းစားကျန်များကို MARPOL 73/78၏ သတ်မှတ်ချက်အတိုင်း 25 mm အရွယ် အစားအောက်ရောက်အောင် ဖြိုခွဲဖျက်ဆီးပြီးမှ ပင်လယ်ထဲသို့ စွန့်ပစ်စေပါသည်။ ကုန်းပေါ်သို့စွန့်ပစ်ရန် ပို့ဆောင်ရသည့်အခါ စွန့်ပစ်ပစ္စည်းဆိုင်ရာ စာရင်းအချက်အလက်များကို စာရင်းပြုစုထားပါသည်။

- **ငါးဖမ်းလုပ်ငန်း** - ZPQ သည် ZPQ နှင့် WPs များမှ ရေမိုင် ၂၄ မိုင်အကွာအထိ စောင့်ကြည့်စစ်ဆေးခြင်းများ ပြုလုပ်ပါသည်။ အန္တရာယ်ကင်းဇုန် 500m ကိုလည်း သတ်မှတ်ထားပြီး ယင်းဧရိယာထဲတွင် သတ်မှတ်ထားသော ယာဉ်များသာ ဖြတ်သန်းသွားလာနိုင်ပါသည်။ အကယ်၍ အခြားယာဉ်များ ယင်း ဧရိယာထဲသို့ ဝင်ရောက်လာပါက ZPQ ရှိ ရေဒီယိုအခန်းမှ အချက်ပေးသံမြည်ပါသည်။ ထို့အပြင် အခြား ရေယာဉ်များ အန္တရာယ်ကင်းဇုန် အတွင်းသို့ ဝင်လာပါက ၎င်းတို့နှင့် ဆက်သွယ်နိုင်ရန် ထောက်ပံ့ရေး ရေယာဉ်များကိုအသုံးပြုပါသည်။ သင့်လျော်သော မီးများနှင့် အချက်ပြမီးများကို ZPQ နှင့် WPs များ တွင် ရေယာဉ်များ မတော်တဆတိုက်မှုမှကာကွယ်ရန် တပ်ဆင် ထားပါသည်။
- **သင်္ဘောအသွားအလာ နှင့် ရေကြောင်းသွားလာရေး** - ZPQ သည် ZPQ နှင့် WPs များမှ ရေမိုင် ၂၄ မိုင် အကွာအထိ စောင့်ကြည့်စစ်ဆေးခြင်းများ ပြုလုပ်ပါသည်။ အန္တရာယ်ကင်းဇုန် 500m ကိုလည်း သတ်မှတ်ထားပြီး ယင်းဧရိယာထဲတွင် သတ်မှတ်ထားသော ယာဉ်များသာ ဖြတ်သန်းသွားလာနိုင်ပါသည်။ အကယ်၍ အခြားယာဉ်များ ယင်းဧရိယာထဲသို့ ဝင်ရောက်လာပါက ZPQ ရှိ ရေဒီယိုအခန်းမှ အချက်ပေး သံမြည်ပါသည်။ ထို့အပြင် အခြားရေယာဉ်များ အန္တရာယ်ကင်းဇုန် အတွင်းသို့ ဝင်လာပါက ၎င်းတို့နှင့် ဆက်သွယ်နိုင်ရန် ထောက်ပံ့ရေးရေယာဉ်များကိုအသုံးပြုပါသည်။ သင့်လျော်သော မီးများနှင့် အချက်ပြ မီးများကို ZPQ နှင့် WPs များတွင် ရေယာဉ်များ မတော်တဆတိုက်မှုမှ ကာကွယ်ရန် တပ်ဆင်ပေးထား ပါသည်။

ငွေ့ရည် (Condensate) မီးရှို့ခြင်းကို Liquid Burner Operation Procedure လုပ်ထုံးလုပ်နည်းအတိုင်း ဆောင်ရွက်ပြီး ၎င်းတွင် ဘေးကင်းလုံခြုံရေးဆိုင်ရာလမ်းညွှန်ချက်များပါရှိပါသည်။

- **လုပ်ငန်းခွင်ဆိုင်ရာကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံရေး** - PTTEPI၏ လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေး စီမံခန့်ခွဲမှု စံချိန်စံညွှန်းကို ပြုစုထားပြီး ဇာတိကစီမံကိန်းတွင် အသုံးပြုပါသည်။ ဝန်ထမ်းများ အားလုံး သည် အလုပ်လုပ်ချိန်တိုင်းတစ်လျှောက်တွင် တစ်ကိုယ်ရည်အကာအကွယ်ပစ္စည်း PPE များ ဝတ်ဆင် ထားရပါသည်။ ဘေးကင်းလုံခြုံရေးဆိုင်ရာသင်တန်းများကို နှစ်စဉ် SSHE သင်တန်းအစီအစဉ်အရ ပို့ချ ပေးပါသည်။ အရေးပေါ်ဆေးသေတ္တာ (သို့မဟုတ်) အရေးပေါ်တုန့်ပြန်ရေးလေ့ကျင့်မှုများကို SSHE Emergency Drill & Exercise Plan အတိုင်း ဆောင်ရွက်ပါသည်။ အသက်ကယ်ဆယ်ရေး အစီအစဉ် စံသတ်မှတ်ချက်ကို ဇာတိကကမ်းလွန် လုပ်ကွက်အရေးပေါ် တုန့်ပြန်မှုအစီအစဉ်နှင့် ဆက်စပ် အစီအစဉ်များအတိုင်း သတ်မှတ်ထားရှိပါသည်။ ကမ်းလွန်အရေးပေါ်ဆေးဘက်ဆိုင်ရာ တုန့်ပြန်မှု

အစီအစဉ် Offshore Medical Emergency Response Plan (MERP) နှင့် Myanmar Asset Crisis Management Plan များကို အကောင်အထည် ဖော်ပြီးဖြစ်ပါသည်။ ဆေးခန်းတွင် ဆေးဘက်ဆိုင်ရာ ကျွမ်းကျင်သူသည် ကုသမှုပေးနိုင်ရန် အမြဲတမ်းရှိပါသည်။ အရေးပေါ်ဖြစ်ရပ်များဖြစ်ပါက Offshore Medical Emergency Response Plan (MERP) အတိုင်း လူနာကို ဆေးဘက်ဆိုင်ရာကျွမ်းကျင်သူက ဦးစွာပြုစုပေးပြီး ရန်ကုန်ရှိဆေးရုံသို့ ရဟတ်ယာဉ်ဖြင့် ပို့ဆောင်ပေးပါသည်။ စက်ပစ္စည်း များ/ကိရိယာ များအသုံးပြုခြင်းဆိုင်ရာ ဘေးကင်းလုံခြုံရေးနည်းလမ်းနှင့် ဘေးကင်းလုံခြုံရေး လုပ်ငန်းစဉ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ပြီးဖြစ်ပါသည်။ ဓာတုပစ္စည်းသိုလှောင်ရာ ဧရိယာများတွင် SDS စာရွက်ကို ဖော်ပြပေးထားပါသည်။

၂၀၂၀ခုနှစ် ဂျူလိုင်လမှ ဒီဇင်ဘာလအတွင်း မတော်တဆဖြစ်မှုဖြစ်ရပ် (၃) ခု ရှိခဲ့ပါသည်။ ၎င်းတို့မှာ ရှေးဦးသူနာပြုဆိုင်ရာဖြစ်ရပ် (FAC) ၂ ခု၊ LOPC ဖြစ်ရပ် ၁ ခု တို့ဖြစ်ပါသည်။ အလားတူဖြစ်ရပ်များ ပြန်လည်မဖြစ်ပေါ်စေရန်အတွက် ပြန်လည်ကုစားခြင်းဆိုင်ရာဆောင်ရွက်မှုများကို အဆိုပြု/အကောင် အထည် ဖော်ခဲ့ပြီးဖြစ်ပါသည်။ မတော်တဆဖြစ်ရပ်များမှတ်တမ်း အကျဉ်းချုပ်ကို Appendix D-6 တွင် ဖော်ပြထားပါသည်။

၈.၂ မတော်တဆဖြစ်ရပ်များအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုလျော့ပါးစေရေးအစီအမံများ လိုက်နာဆောင်ရွက်မှုရလဒ်

- **ရေယာဉ်များတိုက်မိခြင်း** - PTTEP ၏ အရေးပေါ်နှင့်အကျပ်အတည်းအခြေအနေစီမံခန့်ခွဲမှုအစီအစဉ် (PTTEPI's Emergency and Crisis Management Plan) ကို အကောင်အထည်ဖော်ထားပြီး ၎င်းတွင် ရေယာဉ်များမတော်တဆတိုက်မိမှုများဖြစ်ပါက လိုက်နာဆောင်ရွက်ရမည့်နည်းလမ်းများ ပါဝင်ပါ သည်။ Rig mobilization ပြီးသည့်နောက်တွင် ပင်လယ်ရေလုပ်သားများအတွက် အကြောင်းကြားစာ (Notice to Mariner)ကို အစိုးရဌာနများထံသို့ တင်ပြခဲ့ပါသည်။ ZPQ သည် ZPQ နှင့် WPs များမှ ရေမိုင် ၂၄ မိုင် အကွာအထိ စောင့်ကြည့်စစ်ဆေးခြင်းများပြုလုပ် ပါသည်။ အန္တရာယ်ကင်းဇုန် 500m ကိုလည်း သတ်မှတ်ထားပြီး ယင်းဧရိယာထဲတွင် သတ်မှတ်ထားသော ယာဉ်များသာ ဖြတ်သန်း သွားလာ နိုင်ပါသည်။ အကယ်၍ အခြားယာဉ်များ ယင်းဧရိယာထဲသို့ ဝင်ရောက်လာပါက ZPQ ရှိ ရေဒီယိုအခန်းမှ အချက်ပေး သိမြည်ပါသည်။ ထို့အပြင် အခြားရေယာဉ်များ အန္တရာယ်ကင်းဇုန် အတွင်းသို့ ဝင်လာပါက ၎င်းတို့နှင့် ဆက်သွယ်နိုင်ရန် ထောက်ပံ့ရေးရေယာဉ်များကို အသုံးပြုပါသည်။ သင့်လျော်သော မီးများနှင့် အချက် ပြမီးများကို ZPQ နှင့် WPs များတွင် ရေယာဉ်များ မတော်တဆတိုက်မှုမှ ကာကွယ်ရန် တပ်ဆင်ထားပါသည်။

မတော်တဆယိုဖိတ်မှုများ - PTTEP ၏ အရေးပေါ်နှင့်အကျပ်အတည်းအခြေအနေစီမံခန့်ခွဲမှုအစီအစဉ် (PTTEPI's Emergency and Crisis Management Plan) ကို အကောင်အထည်ဖော်ထားပြီး ၎င်းတွင် ဆီ (သို့မဟုတ်) ဓာတုပစ္စည်းများဖိတ်စင်မှုဖြစ်ပေါ်ခဲ့ပါက လိုက်နာဆောင်ရွက်ရမည့် နည်းလမ်းများ ပါဝင်ပါသည်။ ဆီ (သို့မဟုတ်) ဓာတုပစ္စည်းများဖိတ်စင်မှုဖြေရှင်းခြင်းဆိုင်ရာ လေ့ကျင့်မှုများကို

ပုံမှန်ဆောင်ရွက်ပါသည်။ မတော်တဆဖြစ်ရပ်များ နှင့် near miss ဖြစ်ရပ်များကို စီမံကိန်းဝန်ထမ်းများ မှနေ၍ စာရင်းပြုစုထားပါသည်။ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုလမ်းစဉ်များကိုလည်း အကောင်အထည်ဖော်ထားရှိပြီး လိုက်နာဆောင်ရွက်ပါသည်။ ဓာတုပစ္စည်းများကို ၎င်းတို့၏ဝိသေသလက္ခဏာများအရ ခွဲခြားသိုလှောင်ပါသည်။ ချောဆီများ၊ လောင်စာဆီများ၊ သုတ်ဆေးများ နှင့် အခြားဓာတုပစ္စည်းများကို လုပ်ငန်းလည်ပတ်ရာဧရိယာအတွင်းတွင် လိုအပ်သလောက်သာ ထားရှိပါသည်။ ဆီ နှင့်ဓာတုပစ္စည်းများ သိုလှောင်ရာနေရာတိုင်းတွင် bun (သို့မဟုတ်) dip tray ကို ထားရှိပေးထားပါသည်။ ဖိတ်စင်သွားသော ဆီနှင့်ဓာတုပစ္စည်းများကို drum ပုံးများထဲသို့ထည့်၍ မြန်မာနိုင်ငံ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲရေး ဝန်ဆောင်မှု လိုင်စင်ရ DOWA သို့ပို့ဆောင်ကာ စွန့်ပစ်ပါသည်။ ZPQ ၊ WPs များ နှင့် ရေယာဉ်များတွင် သင့်လျော်သော မီးများ နှင့် အချက်ပြမီးများကို ရေယာဉ်များ မတော်တဆတိုက်မှုမှကာကွယ်ရန် တပ်ဆင်ထားပါသည်။ စက်ယန္တရားအားလုံးအတွက် ပုံမှန်စစ်ဆေးခြင်းနှင့် ကြိုတင်ထိန်းသိမ်းကာကွယ်ခြင်း ကို နှစ်စဉ် PM နှင့် စုံစမ်းစစ်ဆေးခြင်းအစီအစဉ်နှင့်အညီ ဆောင်ရွက်ခဲ့ပါသည်။ အပူပိုင်းဆိုင်ကလုန်းနှင့် ပတ်သက်သည့် လုပ်ငန်းစဉ်ကို SSHE Emergency Drill (အရေးပေါ်ဇာတ်တိုက်လေ့ကျင့်မှု) နှင့် Exercise Plan (လေ့ကျင့်ခန်းအစီအစဉ်) အရေးပေါ်ဇာတ်တိုက်လေ့ကျင့်ခန်း ပြုလုပ်ရာတွင် ထည့်သွင်းလေ့ကျင့်ခဲ့ပါသည်။ ဓာတုပစ္စည်းသိုလှောင်ရာဧရိယာများတွင် SDS စာရွက်ကို ဖော်ပြပေးထားပါသည်။ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို အနီရောင် သီးခြား ကွန်တိန်နာပုံးထဲတွင်လည်းကောင်း၊ အထွေထွေ စွန့်ပစ်ပစ္စည်းများကို အပြာရောင်ပုံးများထဲတွင်လည်းကောင်းထည့်၍ ကုန်းတွင်းပိုင်းသို့ပို့ဆောင်ကာ စွန့်ပစ်စေပါသည်။ အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများစွန့်ပစ်မှုအချက်အလက်များကို မှတ်တမ်းတင်သိမ်းဆည်းထားပါသည်။ ထိန်းချုပ်ရေးအဆိုရှင် (control valve) ကို တပ်ဆင်ထားပြီး ထိန်းချုပ်ခန်းမှနေ၍ စောင့်ကြည့်စစ်ဆေးပါသည်။ ကြည့်ရှုစစ်ဆေးခြင်းကို နှစ်စဉ် PM နှင့် စုံစမ်းစစ်ဆေးခြင်းအစီအစဉ် (Inspection Plan) အတိုင်း ဆောင်ရွက်ခဲ့ပါသည်။

- **အပူပိုင်းဆိုင်ကလုန်း** - အပူပိုင်းဆိုင်ကလုန်းဆိုင်ရာလုပ်ငန်းစဉ် (Tropical Cyclone Procedure) ကို အကောင်အထည်ဖော်ထားပါသည်။ ထို့အပြင်အရေးပေါ်ဆိုင်ရာလေ့ကျင့်မှုကိုလည်း SSHE Emergency Drill & Exercise Plan အတိုင်း ဆောင်ရွက်ထားပါသည်။
- **မီးလောင်ကျွမ်းခြင်း (သို့မဟုတ်) ပေါက်ကွဲခြင်း** -မီးငြိမ်းသတ်ရေး ကိရိယာများ နှင့် အချက်ပေးကိရိယာ များကို လုပ်ငန်းဧရိယာထဲတွင် တပ်ဆင်ပေးထားပြီး အော်ပရေတာများကနေ၍ ပုံမှန်ကြည့်ရှုစစ်ဆေး ပါသည်။ အရေးပေါ်ဆိုင်ရာ လေ့ကျင့်မှုကိုလည်း SSHE Emergency Drill & Exercise Plan အတိုင်း ဆောင်ရွက်ထားပါသည်။ မီးလောင်မှု (သို့မဟုတ်) ပေါက်ကွဲမှုဖြစ်ရပ်များအတွက် PTTEPI ၏ အရေးပေါ်နှင့် အကျပ်အတည်းစီမံခန့်ခွဲမှု အစီအစဉ်ကို အကောင်အထည်ဖော်ထားပါသည်။ မီးသတ်ရေစနစ်ကို အော်ပရေတာက ပုံမှန်စစ်ဆေးပါသည်။ ငွေ့ရည်လောင်ကျွမ်းခြင်းကို Liquid Burner Operation Procedure အတိုင်းဆောင်ရွက်ပါသည်။ ၎င်းတွင်

ဘေးကင်းလုံခြုံရေးလုပ်ငန်းစဉ်များကို ရှင်းလင်းစွာ ဖော်ပြထားပါသည်။ Burner package ၏ လေသုံးစွဲမှုကို အော်ပရေတာက စစ်ဆေးပြီး လေစီးဆင်းမှုကို Liquid Burner Operation Procedure အတိုင်းဖြစ်စေရန် သေချာအောင်ဆောင်ရွက်ပါသည်။ WP-1 တွင် ဓာတ်ငွေ့ထောက်လှမ်းရေးစနစ်ကို တပ်ဆင်ထားပြီး အော်ပရေတာက ပုံမှန်စစ်ဆေးပါသည်။ အချက်ပြစနစ်ကို ထိန်းချုပ်ခန်းမှ စောင့်ကြည့်စစ်ဆေးပါသည်။ Burner ဧရိယာတစ်ဝိုက်တွင် CCTV များတပ်ဆင်ထားပြီး ထိန်းချုပ်ခန်းမှနေ၍ စောင့်ကြည့်စစ်ဆေးပါသည်။

၈.၃ ပတ်ဝန်းကျင်ဆိုင်ရာစောင့်ကြည့်စစ်ဆေးခြင်းရလဒ်

ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြည့်စစ်ဆေးခြင်းရလဒ်များအရ စီမံကိန်းသည် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှု လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်းအစီအစဉ် ကို ၁၀၀ ရာခိုင်နှုန်း လိုက်နာ ဆောင်ရွက်မှု ရှိသည်ကို တွေ့ရပါသည်။

(၁) မိလ္လာရေဆိုးစောင့်ကြည့်စစ်ဆေးခြင်း

မိလ္လာရေဆိုးစောင့်ကြည့်စစ်ဆေးခြင်း ကို ၂၀၂၀ ခုနှစ် ဂျူလိုင်လ ၂၁ ရက်နေ့တွင် REM-UAE ဓာတ်ခွဲခန်း နှင့်အကြံပေး ကုမ္ပဏီလီမိတက်သည် ZPQ ရှိ မိလ္လာရေသန့်စင်ခြင်းစနစ်၏ ရေထုတ်ပေါက်နေရာတွင် ဆောင်ရွက်ခဲ့ပါသည်။ ရလဒ်များအရ ပါရာမီတာများအားလုံးသည် အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များတွင် ဖော်ပြထားသည့် MARPOL73/78 နှင့် ကိုက်ညီမှုရှိသည်ကို တွေ့ရှိပါသည်။

(၂) ထွက်ရှိလာသောရေကို စောင့်ကြည့်စစ်ဆေးခြင်း

ထွက်ရှိလာသောရေစောင့်ကြည့်စစ်ဆေးခြင်းကို ၂၀၂၀ ခုနှစ် ဂျူလိုင်လ ၂၁ မှ ဒီဇင်ဘာလအတွင်း ZPQရှိ ထွက်ရှိလာ သော ရေသန့်စင်စနစ်ဆိုင်ရာ ရေထုတ်ပေါက်မှ နမူနာယူ၍ ပြုလုပ်ခဲ့ပါသည်။ oil နှင့် grease ရလဒ်များသည် အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့် ကိုက်ညီမှုရှိသည်ကို တွေ့ရှိရပါ သည်။

(၃) ထွက်ရှိလာသောသဲကို စောင့်ကြည့်စစ်ဆေးခြင်း

ထွက်ရှိလာသောသဲများကို သင့်လျော်ရာပုံး (UN drum ပုံး) တွင် စုဆောင်း၍ ကမ်းပေါ်ရှိ မြန်မာနိုင်ငံ၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲရေးဝန်ဆောင်မှုလိုင်စင်ရ DOWA သို့ပို့ဆောင်၍ စွန့်ပစ်ပါသည်။

Executive Summary

REM-UAE Laboratory and Consultant Company Limited conducted compliance audit of implementation of environmental mitigation measures and monitoring program for Zawtika Development Phase 1C and 1D.

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. Report includes any potential problems or obstacles and propose recommendation for improvement in order to ensure the effectiveness of the prevention and mitigation measures.

The evaluation process includes (1) document review (2) sample collection and analysis and (3) PTTEP team supporting site photos to REM-UAE.

1. Project Overview

PTT Exploration and Production International Limited (PTTEPI) signed the Production Sharing Contract (PSC) of Block M9 and Block M11 with Myanma Oil & Gas Enterprise (MOGE) on November 12, 2003 and July 25, 2005, respectively. Contract Area or Development and Production Area are the same area of a whole of Block M9 and small part in the North Eastern area of Block M11.

The Export Gas Sales Agreement (EGSA) and associated agreements including the Domestic Gas Sales Agreement (DGSA), Supplementary Agreement to Gas Terms of Block M9 and M11 (SAGT), Export Gas Transportation Agreement (EGTA), and Pipeline Right Agreement (PRA) were signed on 30th July 2010. The Overall Daily Contractual Quantity (DCQ) is agreed at 300 MMSCFD with 240 MMSCFD for the export gas to Thailand and 60 MMSCFD for the domestic gas market, 15% swing to reach the Overall Contractual Daily Capacity (CDC) of 345 MMSCFD with the same proportion for exporting to Thailand and domestic gas market.

2. Zawtika Production Development

Based on 2016 Zawtika Field Development Plan, the Zawtika development project is divided into 4 phases comprising of Phase 1A, 1B, 1C, and 1D. Phase 1A, 1B and 1C have already been installed and are currently operational, whereas Phase 1D is planned future development activities.

2.1 Phase 1C

- Consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11. The well fluid from 4 wellhead platforms will be processed to ZPQ via their intra-field pipelines.
- Four (4) Intra-field Pipelines:
 - ZWP8 to IP2 PLEM (18" 22.5 km)
 - ZWP9 to ZWP7 (14" 11 km)
 - ZWP10 to IP2 PLEM (18" 5 km)
 - ZWP11 to IP6PLEM (18" 15 km)

- 2 Pipeline End Manifolds (PLEMs).
 - IP2 PLEM: 3-inlet subsea PLEM (for IP2, IP8 and IP10)
 - IP6 PLEM: 4-inlet subsea PLEM (for IP6, IP11 and 2 future tie-in)
- The first wellhead platform to be installed in Q4 of 2017 and completed all wellhead platforms, associated pipelines and PLEMs installation in Q2 of 2018.
- The production phase of Zawtika 1C was started around November 2018.

2.2 Phase 1D

- consists of 8 remote wellhead platforms namely ZWP12, ZWP13, ZWP14, ZWP15, ZWP16, ZWP17, ZWP18, and ZWP19 including their associated pipelines with 2 pipeline end manifolds (PLEMs).
- Field implementation for installation of Wellhead Platforms will start at Zawtika Field in Q2 2022.

3. Processing System

The process starts with well fluids from remote wellhead platforms flowing into the ZPQ. They are cooled by seawater and arrive marginally above seawater temperature. Well fluids from bridge connected wellhead platform (WP1) are cooled (by air cooler system) before being mixed with the rest of the well fluids.

The incoming well fluids then pass through the production separators, where they are separated into gas, condensate and water streams. Separated gas from separators is compressed in the 1st stage gas compressor to remove some condensate prior to delivery to gas dehydration, where water is removed. Dry gas passed from the dehydration unit is cooled and compressed at 2nd stage gas compressor train and passed to the 28" offshore export pipeline to the onshore section. Some of dry gas is diverted to be used as fuel for other processes and power generation supplied for the ZPQ.

Production liquids separated from the gas consist of condensate and produced water. Condensate will be burned using smokeless burner at WP1.

Regarding produced water, there is no heavy metal Hg, As from gas and water analysis for all the explored areas. PTTEPI has conducted monthly produced water analysis since the beginning of their operations, and no heavy metals have been found. As such, produced water separated from the production separators and some from the condensate flash drum at the maximum design of 20,000 bpd is being sent to a de-oiler unit to separate residual condensate back to flash drum prior to tipping overboard with the treated water to meet the Myanmar's National Environmental Quality Guidelines (EQEG) Standards.

4. Emission and Effluent Management

4.1 Flaring

ZPQ is equipped with HP and LP gas flare systems that cater for safe and reliable disposal of planned and unplanned releases of hydrocarbon gas from the production facilities. Flare knock out drums are provided on the HP and the LP systems. The configuration of level control is on/off gas level control, as normally no continuous liquid is expected. The normal liquid level is controlled to be as low as practically possible to

maximise the available volume for any liquid relief and also the gas area to improve liquid knock-out. Liquids from both HP and LP flare knock out drum are collected in closed drain vessel.

At all wellhead platforms (WP1-WP11), a temporary (removable type) flare boom and a gas-liquid burner for well clean up is provided. Two tie-in points (one at East and one at West sides of the platform) are provided for the temporary burner on all of the WPs.

4.2 Waste and Wastewater

Waste generated from the Project activities will be segregated into 2 main types according to criteria of danger as non-hazardous waste and hazardous waste.

5. Utilities

5.1 Power and Energy Use

ZPQ is equipped with 3 dual fuel gas turbine power generation units, each of 3.7 MW site rated capacity, which supply all required power to ZPQ and WP1. Multiple gas turbine driven units with adequate capacity to ensure availability of power when a unit is not operational are provided.

A treble fuel design (fuel gas, condensate and diesel) for all three power generation units has been selected, but the connection is made for fuel gas and diesel only. Electric motor start systems are provided for all three power generators.

Emergency diesel power generation of 1.28 MW is provided for essential load in case of turbine generator trip. A black start diesel generator of 280 kW is also provided for initial start.

5.2 Water Use

Two reverse osmosis water production units with capacity of 1.5 m³/hr, total 3 m³/hr are provided for fresh water production using RO membrane. The water produced by these units is suitable for consumption, plus other intermittent uses, such as eyewash, safety shower, etc. Fresh water from the fresh water units is supplied and stored in fresh water storage tanks. The stored fresh water is then transferred via pumps to the pressurized fresh water vessel for distribution to various users. Potable water suitable for drinking is supplied after treatment of freshwater by a sterilizer.

6. Emergency Shutdown System

ZPQ is designed to provide fully automatic, integrated and centralized platform/process control. The control room operator is able to monitor, detect, and handle process upsets from the control room through Process Control system (PCS), Safety Instrument System and Fire and Gas System (SIS and FGS) for facilities on ZPQ, the bridge connected wellhead platform and remote wellhead platforms.

The ZPQ semi-automatic start-up sequences and automatic safe shutdowns are implemented in the control system. Closed circuit television (CCTV) monitors are provided in the control room to monitor critical process equipment/systems. Online analyzers are provided to monitor the content in the feed/sales gas.

7. Project's Environmental, Social and Health Policies

PTTEPI 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 PTTEPI's SSHE Policy. Proactive individual involvement, responsibility and accountability are expected of all employees, contractors and third party personnel. PTTEPI SSHE Management System (SSHE MS) is designed to align all stakeholders' efforts to enable attainment of these principles.

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

8. Compliance Status

The results determined that the project completely complied on the Mitigation Measures for production phase and the unplanned events with 100% for the activities that have situation.

PTTEPI complied with most of the mitigation measures prescribed in the EIA. Main issues are summarized below.

8.1 Environmental Mitigation Measures Compliance Result in Production/Operation Phase

- **Air Quality** - Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. Annual pollutant release inventory was recorded monthly basis. Moreover, venting and flare were performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup. The volumes of gas flared for all flaring events were daily recorded by project staff.
- **Seawater & Sediment Quality** - Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78. Oil-contaminated wastewater was collected in the drum for disposal by onshore contractor, the license waste management service. Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater. Emergency spill response equipment was provided near all oil and chemical storage area. After usage all were kept in the hazardous waste container and sent to dispose by DOWA, the license waste management service in Myanmar.
- **Marine Life and Marine Ecology** - Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's EQEG. All equipment of water treatment system were regularly inspected as per the annual PM and Inspection Plan.

Produced water was collected to treat at ZPQ and monitored everyday to control TOG value as per requirements of Myanmar's EQEG. Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.

Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded.

Furthermore, non-hazardous wastes were segregated as food waste, paper, recycle waste and other waste and kept in the bins attached with colour code. The food waste was grinded to a size less than 25 mm before discharge into the sea as per the requirements under MARPOL 73/78. All wastes were recorded regularly when sent to dispose at onshore.

- **Fishing** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. In addition, support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.
- **Shipping and Navigation** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.

Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document.

- **Occupational Health and Safety** - PTTEPI's Occupational Health Management Standard was prepared and applied for Zawtika project. All staffs wear appropriate PPE at all working time. The safety training schedule was performed as per SSHE annual training plan. The safety case or emergency drill was performed as per SSHE Emergency Drill & Exercise Plan. Life saving program standard was specified in Zawtika Offshore Field Emergency Response Plan and others related plan. Offshore Medical Emergency Response Plan (MERP) and Myanmar Asset Crisis Management Plan were already implemented. First-aid kits and medic room were provided. The medic was stand by at medic room for medical treatment. In case of emergency, the patient will be pre-treatment by medic and will sent to the hospital in Yangon by helicopter as per The Offshore Medical Emergency Response Plan (MERP). Safety method for working with machines/ equipment and procedure for safety operation were already implemented. The SDS was attached at all chemical storage area.

There were total 3 cases of incident during July to December 2020 including 2 case of first aid case (FAC) and 1 case of LOPC. Corrective actions were proposed/implemented to prevent reoccurrence. The summary of incident record as shown in Appendix D-6.

8.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

- **Vessel collision** - PTTEPI's Emergency and Crisis Management Plan was implemented which the procedures in the event of an accidental vessel collision was included. The notice to mariner was already submitted to government authorities after rig mobilization. ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.
- **Accidental Spills** - PTTEPI's Emergency and Crisis Management Plan was already implemented which the oil or chemical spills was included. The exercise of oil or chemical spills was regularly performed. The incident and nearmiss record was collected by project staffs. Waste management procedure was already implemented and followed. The chemical was separated to store according to their characteristics. The lubricants, fuels, paints and other chemicals were stored only necessary amounts at operation area. The bun or dip tray was already provided at all oil and chemical storage area. Any spilled oil and chemical was collected into drum and sent to dispose by DOWA, the license waste management service in Myanmar. The appropriate lights and warning signals were already provided on ZPQ, WPs and all vessels to prevent accidental collision. Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. The Tropical Cyclone Procedure was implemented including the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. The SDS was attached at all chemical storage area. Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded. The control valve was already installed and monitored by control room. The inspection was performed regularly as per the annual PM and Inspection Plan.
- **Tropical cyclone** - The Tropical Cyclone Procedure was implemented. Also, the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.
- **Fire or Explosion** - The firefighting equipment and alarm were provided in the area and regularly inspected by operators. The emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. PTTEPI's Emergency and Crisis Management Plan was implemented in case of fire or explosion occurrence. The firewater system was regularly inspected by operator. Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document. The air consumption of the burner package was checked by operator to ensure adequate air flow as per the Liquid Burner Operation Procedure. The gas detection system was installed at WP-1 and regularly checked by operator. The alarm was monitored by control room. The CCTV was already installed at burner area and monitored by control room.

8.3 Environmental Monitoring Result

The results of Environmental Impact Monitoring determined that the project completely complied with 100%.

1) Sewage Monitoring

Sewage monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on July 21, 2020 from sewage treatment system discharge point at ZPQ. The result found that all of parameters complied with MARPOL73/78 as specified in National Environmental Quality (Emission) Guidelines.

2) Produced Water Monitoring

Produced water monitoring at ZPQ was conducted from Produced Water treatment system discharged point during July to December 2020. The results found that oil and grease were complied with National Environmental Quality (Emission) Guidelines.

3) Produced Sand Monitoring

Produced sand was collected in the proper container (UN drum) and sent to dispose at onshore facility which is DOWA, the license waste management service in Myanmar.

Chapter 1

Chapter 1

Introduction

1.1 Introduction

The Zawtika Project is a gas field development project located in Block M9 and a small portion of Block M11 in the Gulf of Martaban (also known as the Gulf of Moattama), Myanmar. The existing development of Zawtika Project has thus far covered Phase 1A, Phase 1B and Phase 1C.

Following the success of Phase 1A and 1B and 1C Development, PTTEPI plans to develop Zawtika Phase 1D by installation of 8 remote wellhead platforms at nearby area of Phase 1A, 1B and 1C in Block M9.

Details of each development phase are outlined as follows:

- Phase 1A and 1B consists of ZPQ (Processing platform integrated with Living Quarter module), a bridged-link wellhead platform ZWP1, other remote wellhead platforms namely ZWP2, ZWP3, ZWP4, ZWP5, ZWP6 and ZWP7, associated intra-field sealines and 230 km offshore gas transportation pipeline.
- Phase 1C consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11 including their associated pipelines with 2 pipeline end manifolds (PLEMs). The first platform to be installed in Q4 of 2017. The production phase of Zawtika 1C was started around November 2018.
- Phase 1D consists of 8 remote wellhead platforms namely ZWP12, ZWP13, ZWP14, ZWP15, ZWP16, ZWP17, ZWP18, and ZWP19 including their associated pipelines with 2 pipeline end manifolds (PLEMs). Field implementation for installation of Wellhead Platforms will start at Zawtika Field in Q2 2022.

The Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D was approved by MOGE and ECD according to the approval letter number MD 100 3/6 (2338) 2018 and (Forest)3(2)/16(D) (3207/2018), respectively (Appendix A). As per commitment in Environmental Impact Assessment (EIA) Report, PTTEPI has the responsibility to follow the environmental mitigation and monitoring measures including submits the monitoring report to MOGE and ECD. Therefore, PTTEPI, 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 EIA and report the results to MOGE and ECD as prescribing in EIA.

In this monitoring report is an environmental impact monitoring and mitigation measures implementation compliance report which covered of Zawtika Phase 1C production period.

1.2 Objective

The main objectives of this report are:

- To evaluate the effectiveness of implementation of the Environmental Impact Assessment, including both mitigation and monitoring measures, defined in the EIA report; and

- 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 Briefly Information of the Project

1.3.1 General Information and Background

- 1) Project Name: Zawtika Development Phase 1C and 1D
- 2) Project Location: Block M9 and a small portion of Block M11 in the Gulf of Martaban
- 3) Project Owner: PTTEP International Limited (Yangon Branch)
- 4) Report Preparation: REM-UAE Laboratory and Consultant Company Limited
- 5) Production Period: Zawtika Phase 1 C Start in November 2018

1.4 Project Overview

1.4.1 Concession Background

PTTEP International Limited (PTTEPI) signed the Production Sharing Contract (PSC) of Block M9 and Block M11 with Myanmar Oil & Gas Enterprise (MOGE) on November 23, 2003 and July 25, 2005, respectively. Contract Area or Development and Production Area are the same area of a whole of Block M9 and Block M11.

The Export Gas Sales Agreement (EGSA) and associated agreements including the Domestic Gas Sales Agreement (DGSA), Supplementary Agreement to Gas Terms of Block M9 and M11 (SAGT), Export Gas Transportation Agreement (EGTA), and Pipeline Right Agreement (PRA) were signed on July 30, 2010. The Overall Daily Contractual Quantity (DCQ) is agreed at 300 MMSCFD with 240 MMSCFD for the export gas to Thailand and 60 MMSCFD for the domestic gas market, 15% swing to reach the Overall Contractual Daily Capacity (CDC) of 345 MMSCFD with the same proportion for exporting to Thailand and domestic gas market.

1.5 Project Location

1.5.1 Concession Area

The Zawtika Project is located in the Gulf of Moattama offshore Myanmar, covering an area of 12,306 km² which includes the entire area of 11,746 km² of Block M9 and 560 km² of Block M11. The field lies approximately 300 km south of Yangon and 290 km west of Dawei on the Myanmar coast.

1.5.2 Administrative Boundaries

Zawtika project is located in Block M9 and small portion of Block M11. Block M9 lies approximately 300 km from Yangon, 192 km from the nearest coast towards Yangon, 178 km west of the nearest coast in Tanintharyi Region, and 114 km south of Ayeyarwady Region. Block M11 is located in the south of Block M9, Gulf of Martaban. It is approximately 188 km south of the Deltaic Coastal Zone and 265 km west of Dawei. The project location is indicated on the Figure 1-1.

PTTEPI engaged with various local authorities, including Yangon Region, Tanintharyi, and Mon Regional Offices. Based on these discussions, it is expected that Yangon Region, Tanintharyi Region, and Mon State were the most relevant administrative locations in terms of potential impacts from the Project.

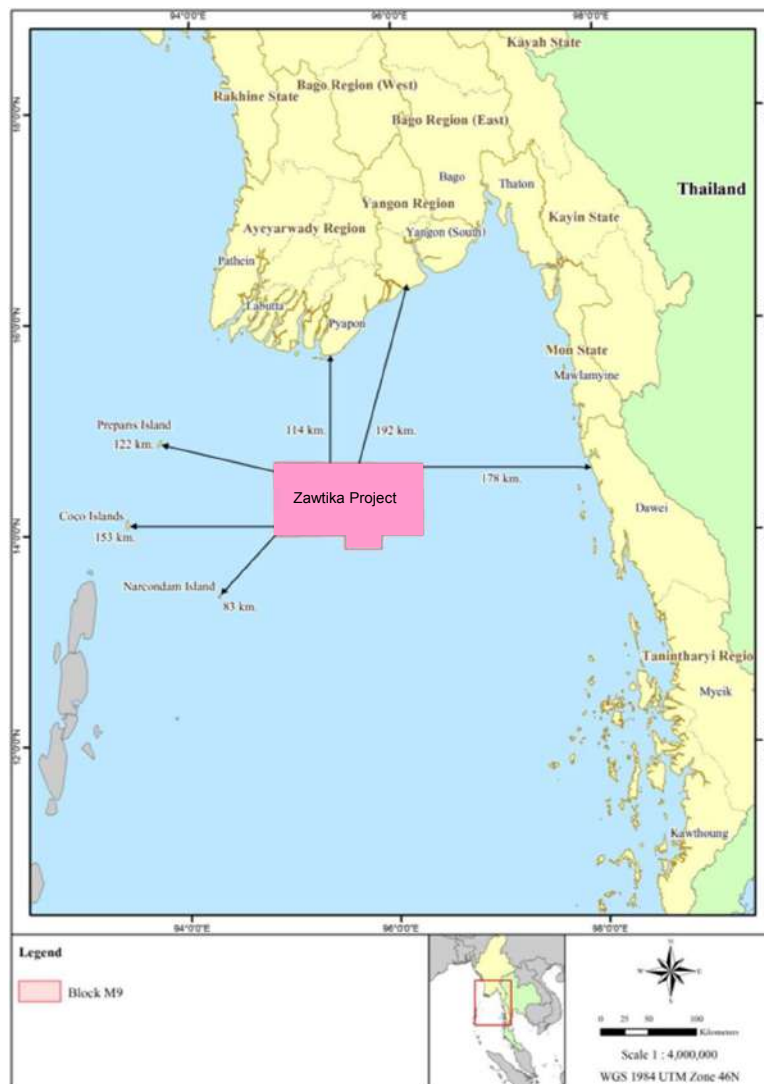


Figure 1-1 Distance of Zawtika Project to Nearest Land

Source: Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D, PTTEPI International Limited (PTTEPI)

1.6 Zawtika Production Development

Based on 2016 Zawtika Field Development Plan, the Zawtika development project is divided into 4 phases comprising of Phase 1A, 1B, 1C, and 1D. Phase 1A and 1B have already been installed and are currently operational as per another EMP, whereas Phase 1C has operated in November 2018 and 1D has not start yet. This monitoring report is therefore focusing only on Zawtika Phase 1C operation activities. An overview of phase 1C are described below.

1.6.1 Phase 1C

- Consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11. The well fluid from 4 wellhead platforms were processed to ZPQ via their intra-field pipelines.
- Four (4) Intra-field Pipelines:
 - ZWP8 to IP2 PLEM (18" 22.5 km)
 - ZWP9 to ZWP7 (14" 11 km)
 - ZWP10 to IP2 PLEM (18" 5 km)
 - ZWP11 to IP6PLEM (18" 15 km)
- 2 Pipeline End Manifolds (PLEMs).
 - IP2 PLEM: 3-inlet subsea PLEM (for IP2, IP8 and IP10)
 - IP6 PLEM: 4-inlet subsea PLEM (for IP6, IP11 and 2 future tie-in)
- The first wellhead platform installed in Q4 of 2017 and completed all wellhead platforms, associated pipelines and PLEMs installation in Q2 of 2018.

Coordinates of each remote wellhead platform are shown in Table 1-1. Zawtika Schematic Network for Phase 1C and 1D (both existing and planned) is shown in Figure 1-2.

Table 1-1 Coordinates of WPs in Zawtika Phase 1C

Remote Wellhead Platform	Coordinates (WGS 84)	
	X	Y
Phase 1C		
ZWP8	482763	1582946
ZWP9	516403	1574219
ZWP10	502268	1582048
ZWP11	479513	1569987

Source: Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D, PTTEPI International Limited (PTTEPI)

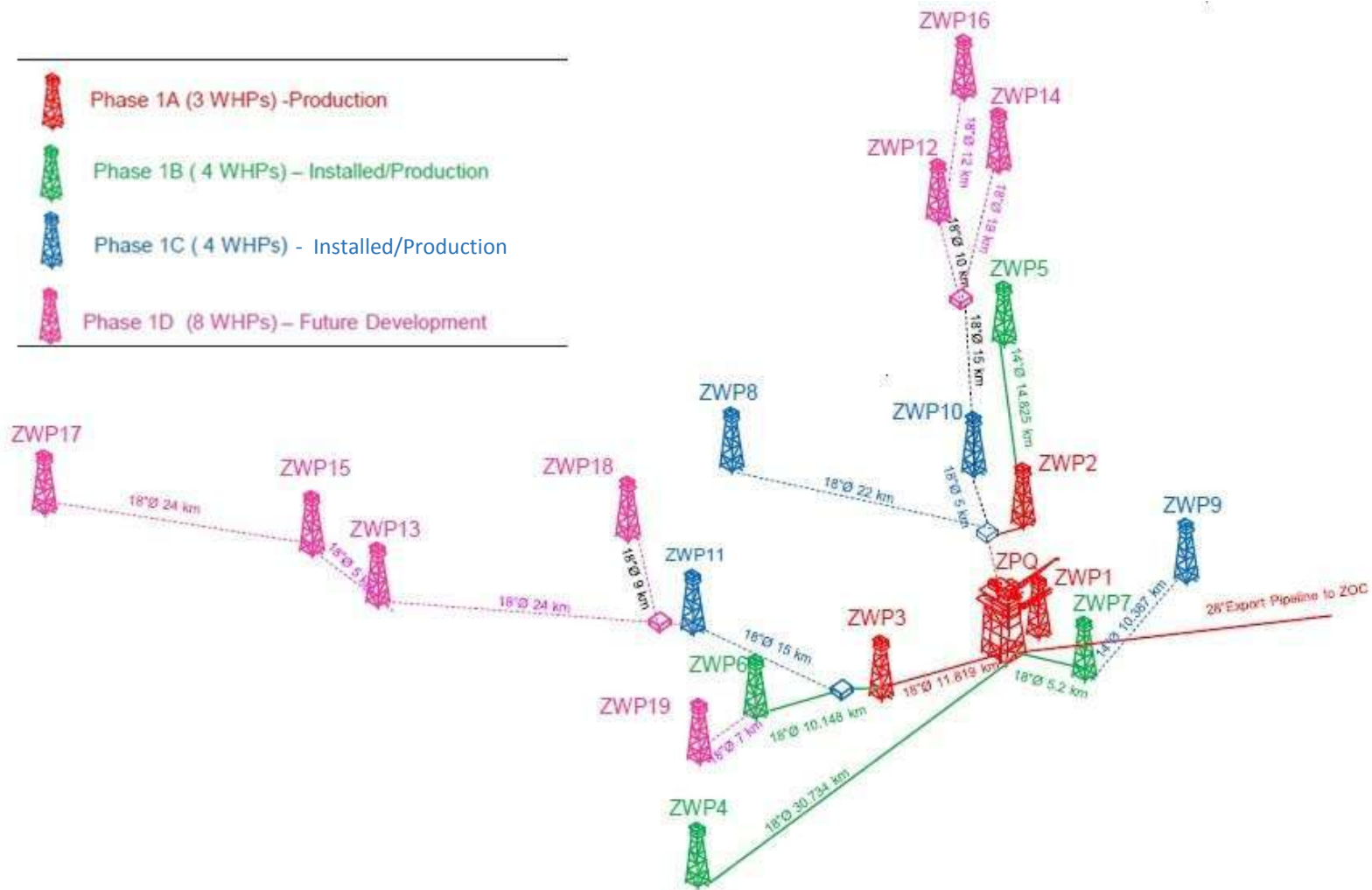


Figure 1-2 Zawtika Schematic for Phase 1C and 1D Existing and Planned Facilities

Source: Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D, PTTEPI International Limited (PTTEPI)

1.7 Status of Current Operations

Due to Phase 1D has not start yet, Table 1-2 and Figure 1-3 will show only current operation of Phase 1C.

Table 1-2 Operational status of the Zawtika Offshore Development Project

Facility/ WP	Current Status
Phase 1C	
ZWP8	Production
ZWP9	Production
ZWP10	Production
ZWP11	Production

Remark: PTTEPI, (Dated on May 27, 2020)

1.8 Components of Zawtika Offshore Facilities

Descriptions for each component for Zawtika offshore development are summarized in below subsections.

1.8.1 Zawtika Processing and Living Quarter Platform (ZPQ)

ZPQ is an integrated living quarters and processing platform, located in a water depth of approximately 140 m in Blocks M9, Gulf of Martaban. This facility receives gas from Zawtika wellhead platforms (WP1- WP11) and then sends the gas onwards to processing facilities prior to transporting onshore via a 28" diameter export pipeline. The offshore pipeline is connected to the onshore pipeline at the landfall point in Mawgyi village. ZPQ installations will be permanently manned around the clock. The ZPQ has a maximum onboard capacity of 165 personnel.



Figure 1-3 Zawtika Processing and Living Quarter Platform (ZPQ)

Source: From <https://multimedia.pttep.com>

1) ZPQ Processing Facilities

The processing facilities on the ZPQ can be categorized into the following groups:

- **Receiving Facilities** including pig receivers and manifolds to receive well fluids from remote wellhead platforms, wellhead coolers (either air cooler or seawater cooler) to cool the production fluids received from the bridge connected wellhead platform (WP- 1) and the 3 phase Inlet Separator to remove the gas from well fluids, condensate from the water phase, and to absorb pipeline. There is no mercury removal, H₂S, or CO₂ removal system.
- **Gas Processing Facilities**
 - **1st Stage Gas Compression:** The gas from the inlet separator is compressed to approximately 58 barg (841 psig) by three 1st Stage Gas Compression trains. Each train includes a suction scrubber, a discharge cooler (Air cooling) and a gas turbine driven centrifugal compressor.
 - **Glycol Dehydration and Regeneration:** The gas will be dehydrated after the 1st stage of compression. The dehydration specification is 5 lb/MMscf based giving a margin below the 7 lb/MMscf sales gas specification.
 - **2nd Stage Gas Compressor:** The export gas is compressed further using three compression trains and metered (not fiscal meter) before being exported to ZOC onshore via an export subsea pipeline.
- **Condensate System:** The condensate is treated to remove the light ends and water via heating and a low pressure 3 phase separator and then routed to storage after cooling. The system includes an electric heater at flash vessel, and stabilized condensate is stored at the condensate storage vessel prior to burning at WP- 1 (via smokeless burner), or alternatively utilizing for glycol regeneration package for fuel burner.
- **Produced Water Treatment:** Produced water from the inlet separator is treated for removal of sand, suspended solid particulate matter and associated hydrocarbon removal before being disposed overboard to the sea. Produced water is discharged overboard with maximum oil in water of 40 ppm, and complies with Myanmar's National Environmental Quality (Emission) Guidelines (EQEG) Management methods for produced water at Zawtika are discussed in Table 1-3.
- **Produced Sand Management** – Produced sand, removed from pigging operations, is generated at Zawtika in quantities of approximately 40 tons/year. Produced sand management is discussed in Table 1-3.

2) Living Quarter Module (LQM)

ZPQ also supports a Living Quarters Module (LQM) located on the west side of the platform at upper deck level. LQM is a self-contained four level building including helideck, designed for a single lift prior to topsides loadout. This module is designed for permanently accommodating 88 people and temporarily accommodating up to 128 people (during platform commissioning, shutdown and major maintenance activities).

1.8.2 Zawtika Wellhead Platform (WP)

Currently, there are 11 WPs (WP 1-11) in Zawtika field. They are automated for unmanned operations, with personnel presence required for replenishing consumables (e.g., corrosion inhibitor, diesel etc.), maintenance and restart following emergency shut down only. Sufficient operating data is communicated to ZPQ to monitor the status of safety and production critical systems.

WP1 is bridge linked to ZPQ, while WP2 to WP11 are structurally identical remote wellhead platforms. Remote platform access is by means of helicopter or boat during daylight hours and in calm conditions. The frequency of regular visits to the remote wellhead platforms is once every 2 weeks, depending on operations' activities. During drilling / wire line /well services, the remote facilities are temporarily manned.



Figure 1-4 Zawtika Wellhead Platform (WP)

Generic layout of ZPQ and WP is provided in Figure 1-5 and Figure 1-6.

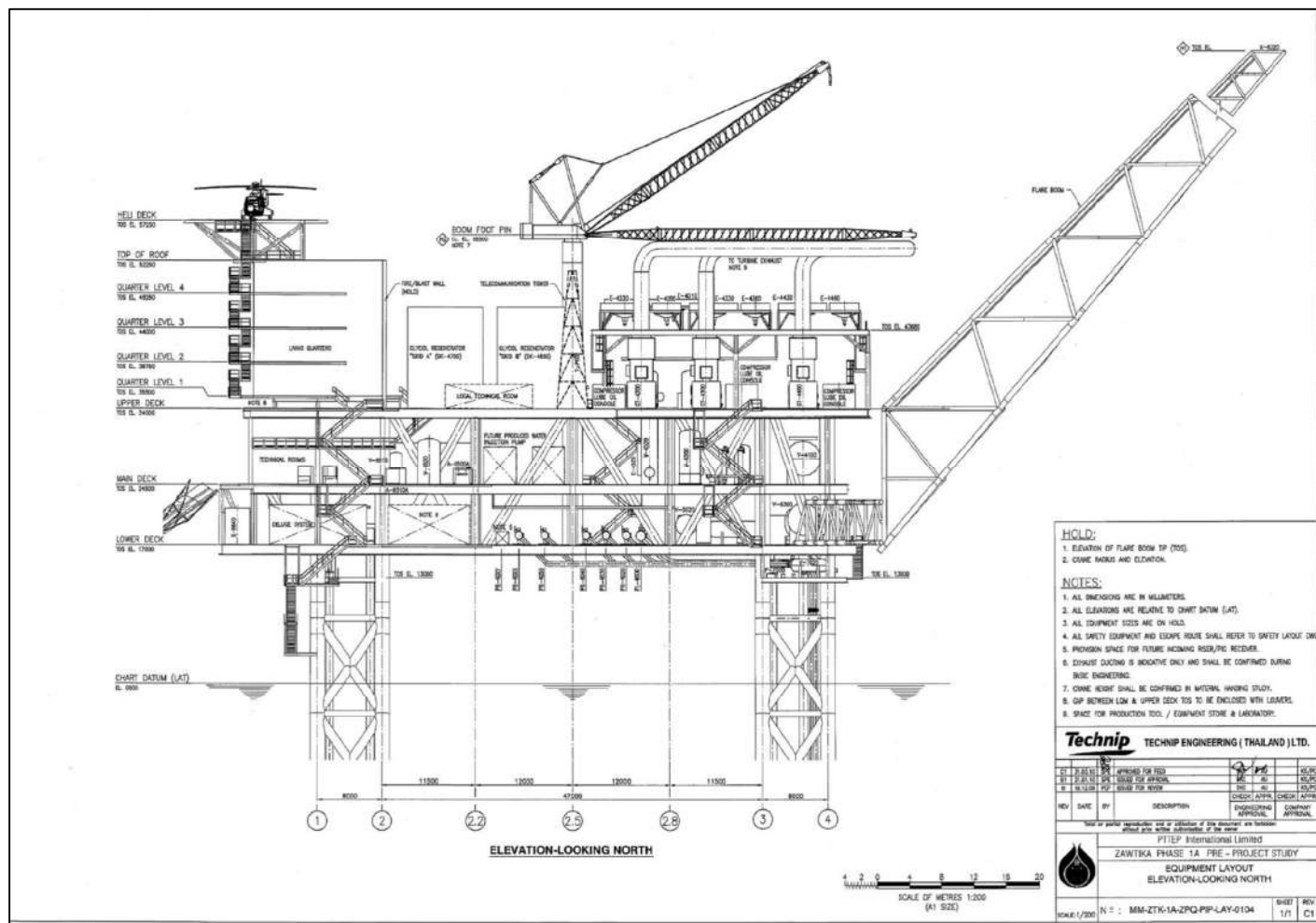


Figure 1-5 Generic Layout of ZPQ

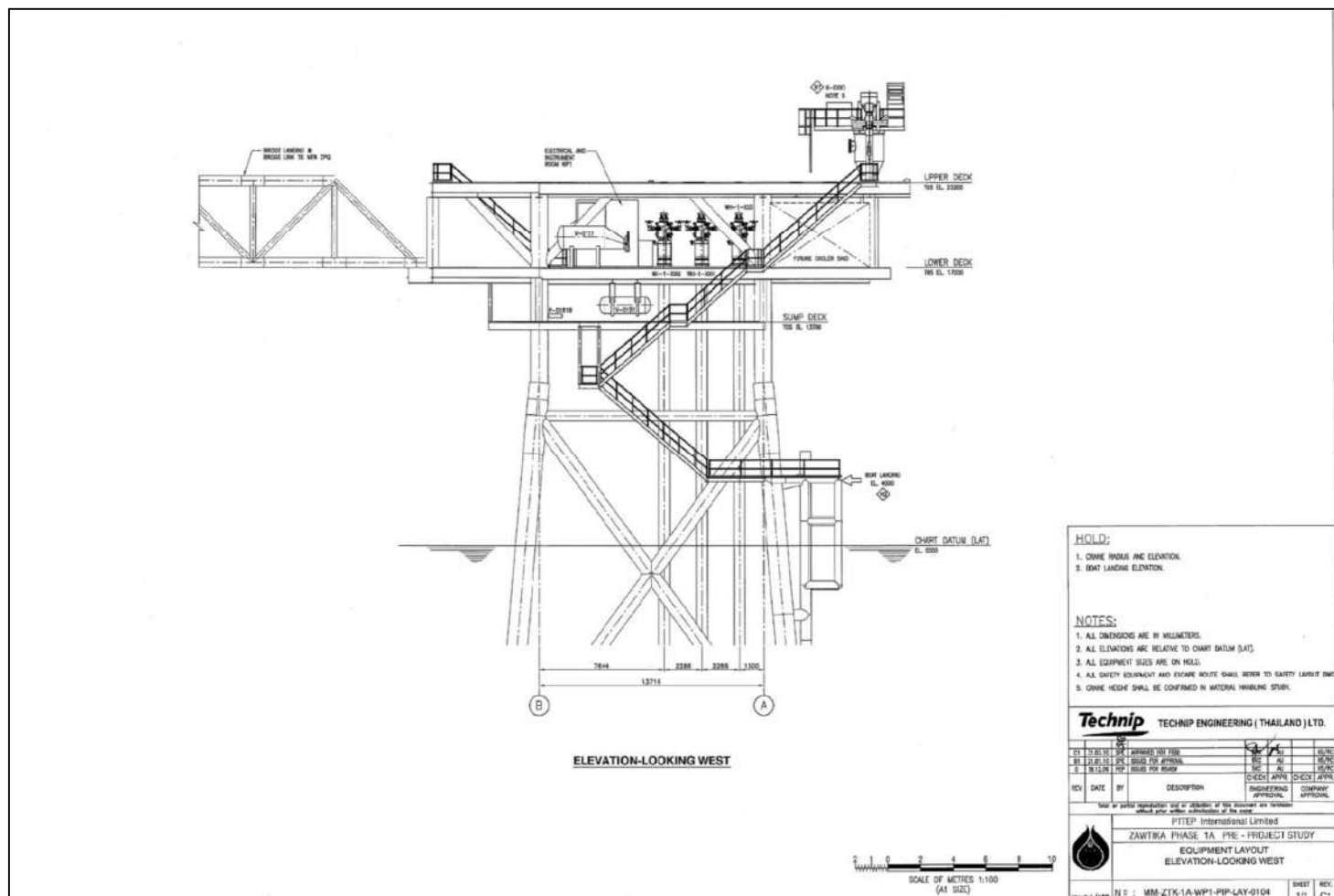


Figure 1-6 Generic Layout of WP

1.8.3 Zawtika Offshore Gas Transportation System

The Zawtika offshore gas pipeline system comprises of the following pipeline networks:

- Six Intra-field Sealines
 - 18" Sealine from WP2 to ZPQ with approximately length of 10.8 km;
 - 18" Sealine from WP3 to ZPQ with approximately length of 11.05 km;
 - 18" Sealine from WP4 to ZPQ with approximately length of 30 km;
 - 14" Sealine from WP5 to WP2 with approximately length of 14.5 km;
 - 18" Sealine from WP6 to WP3 with approximately length of 10 km; and
 - 18" Sealine from WP7 to ZPQ with approximately length of 5 km.
- Gas Export Pipeline
 - 28" Offshore Gas Export Pipeline from ZPQ to land fall point near Mawgyi village with approximately length of 230 km.

For Zawtika Phase 1C

- Consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11. The well fluid from 4 wellhead platforms were processed to ZPQ via their intra-field pipelines.
- Four (4) Intra-field Pipelines:
 - ZWP8 to IP2 PLEM (18" 22.5 km)
 - ZWP9 to ZWP7 (14" 11 km)
 - ZWP10 to IP2 PLEM (18" 5 km)
 - ZWP11 to IP6PLEM (18" 15 km)
- 2 Pipeline End Manifolds (PLEMs).
 - IP2 PLEM: 3-inlet subsea PLEM (for IP2, IP8 and IP10)
 - IP6 PLEM: 4-inlet subsea PLEM (for IP6, IP11 and 2 future tie-in)

The design life of the intra-field sealines and export pipeline are 30 years. The design of the pipeline system complies with the requirements of the latest editions of ASME B31.8 and International Codes and Standards.

1.8.4 ZPQ Processing System

The overall processing scheme for the ZPQ is shown in Figure 1-7. The process starts with well fluids from remote wellhead platforms flowing into the ZPQ. They are cooled by seawater and arrive marginally above seawater temperature. Well fluids from bridge connected wellhead platform (WP1) are cooled (by air cooler system) before being mixed with the rest of the well fluids.

The incoming well fluids then pass through the production separators, where they are separated into gas, condensate and water streams. Separated gas from separators is compressed in the 1st stage gas compressor to remove some condensate prior to delivery to gas dehydration, where water is removed. Dry gas passed from the dehydration unit is cooled and compressed at 2nd stage gas compressor train and passed to the 28" offshore export pipeline to the onshore section. Some of dry gas is diverted to be used as fuel for other processes and power generation supplied for the ZPQ.

Production liquids separated from the gas consist of condensate and produced water. Condensate will be burned using smokeless burner at WP1.

Regarding produced water, there is no evidence of heavy metal Hg, As from gas and water analysis for all the explored areas. PTTEPI has conducted monthly produced water analysis since the beginning of their operations, and no heavy metals have been found. As such, produced water separated from the production separators and some from the condensate flash drum at the maximum design of 20,000 bpd is being sent to a de-oiler unit to separate residual condensate back to flash drum prior to tipping overboard with the treated water to meet the Myanmar's National Environmental Quality (Emission) Guidelines (EQEG).

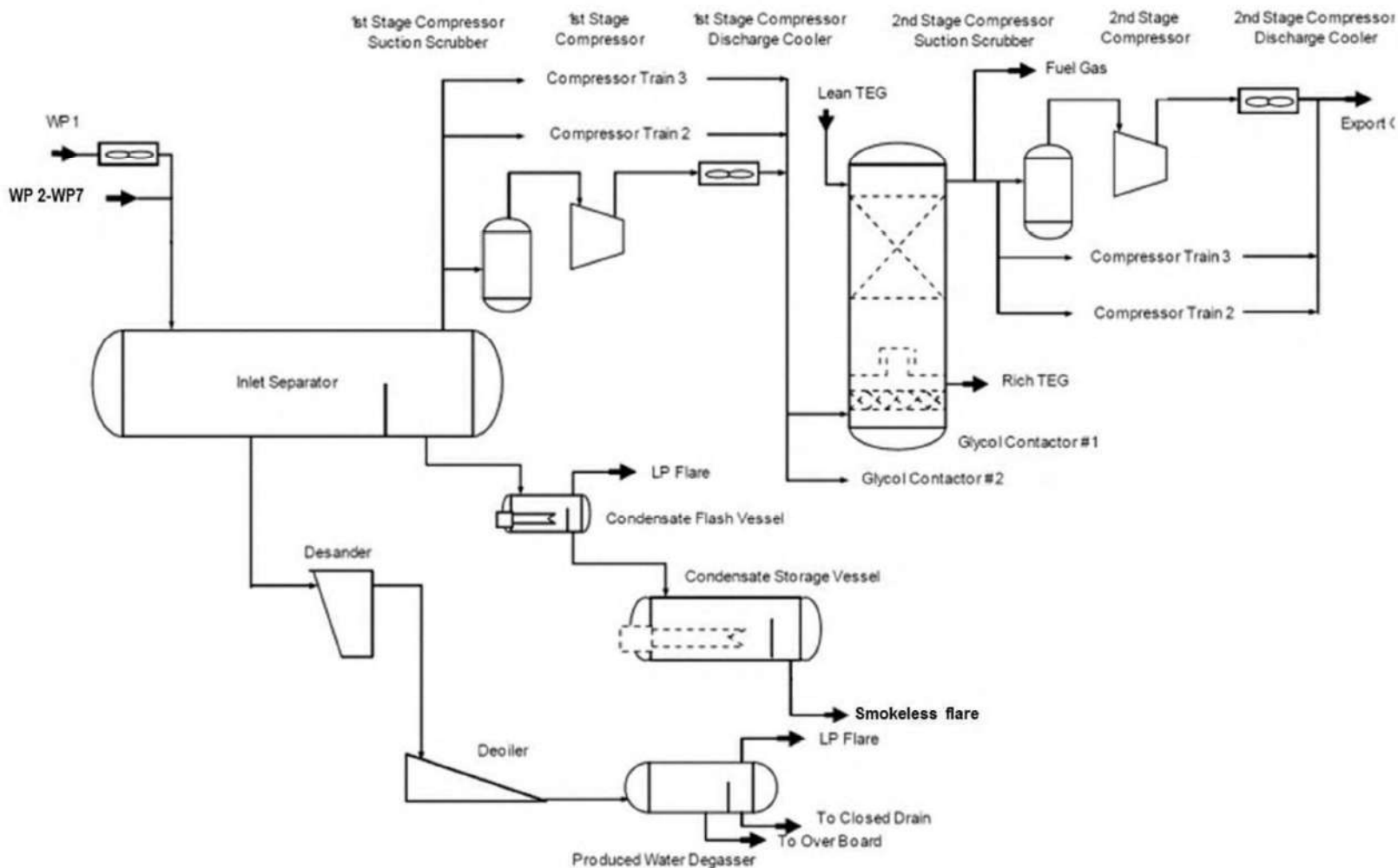


Figure 1-7 Simplified Diagram of ZPQ Processing System

1.8.5 Emission and Effluent Management

1) Flaring

ZPQ is equipped with HP and LP gas flare systems that cater for safe and reliable disposal of planned and unplanned releases of hydrocarbon gas from the production facilities.

The HP and LP flare tip are mounted on inclined boom away from platform to avoid excessive radiation on platform. HP flare tip is Sonic type and sub sonic LP flare tip is pipe flare. Design of HP and LP tip ensure stable operation of smokeless flare and flame lift off. Flare tip is designed to avoid atmospheric air ingress and flame lick during normal plant operations when only pilots are lit and strong winds are prevalent.

Flare knock out drums are provided on the HP and the LP systems. The configuration of level control is on/off gap level control, as normally no continuous liquid is expected. The normal liquid level is controlled to be as low as practically possible to maximize the available volume for any liquid relief and also the gas area to improve liquid knock-out. Liquids from both HP and LP flare knock out drum are collected in closed drain vessel.

At all wellhead platforms (WP1-WP11), a temporary (removable type) flare boom and a gas-liquid burner for well cleanup is provided. Two tie-in points (one at East and one at West sides of the platform) are provided for the temporary burner on all of the WPs.

PTTEPI has also installed a smokeless burner at WP1, primarily for the disposal of excess condensate.

1.8.6 Waste and Wastewater

1) PTTEPI Waste Management Procedure

Waste generated from the Project activities will be segregated into 2 main types according to criteria of danger as non-hazardous waste and hazardous waste.

(1) Non-Hazardous Waste

Non-Hazardous waste is the waste which, although not harmless, present a lower level of risk to human health and the environment. There are 2 types of non-hazardous waste as follows:

- General non- hazardous wastes from office, catering services, laundry, household, etc. from industrial activities, e.g.
 - General waste (e.g. scrap metal, non-biodegradable waste, gardening waste, construction material);
 - Recyclable or reusable waste (e.g. paper, wood, drinking plastic bottle, glass); and
 - Biodegradable waste (e.g. food waste, sewage).
- Waste containing or contaminated with hazardous substances in concentrations that, before or after treatment, are considered low enough to meet the specified international or regulatory discharge criteria which do not exceed the standard limit of the country, e.g.
 - Produced water and
 - Produced sand

(2) Hazardous Waste

Hazardous waste is defined as any waste which causes or is likely to cause danger to health or the environment by reason of their chemical activity or toxic, flammable, explosive, corrosive, or other characteristics, whether alone or when coming into contact with other wastes. Forms of hazardous waste include solids, sludge, liquid and containerized gas and hydrocarbon waste.

Hazardous waste shall be categorized into 2 main types as follows:

- Wastes creating nuisance due to flammability, reactivity, corrosiveness, radioactive, infection, toxicity for humans & the environment or, e.g.
 - General hazardous wastes (e.g. chemical waste and residue, paint, spent and used oil, contaminated packing material, special maintenance waste, contaminated sludge, combustion residue, photocopy machine, PC printers polluting cartridge, medical waste, filter, fluorescent, bulb);
 - Heavy metal wastes (e.g. mercury, arsenic, cadmium); and
 - Batteries

It is noted that, if there will be a presence of incoming heavy metals from reservoir, the incurred wastes in contact with the incoming gas or fluid shall be considered as being contaminated with the heavy metal (e.g. mercury, arsenic, cadmium), and therefore is classified as hazardous waste which will require specific handling procedure apart from this procedure.

- Waste containing or contaminated with hazardous substances in concentrations which belong exceed the standard limit of country regulation or international hazardous waste standard, for example oil concentration or heavy metals containing waste. Laboratory analysis of its waste component shall be applied to properly classify this type of waste. Furthermore any waste that belong to any category in the country regulation.

Details on PTTEPI's waste management procedures according to its type are provided in Table 1-3.

Table 1-3 Management of Waste and Wastewater for Offshore Operation

Type of Waste	Waste Management
General non-hazardous waste	<ul style="list-style-type: none"> • Store in durable container and clearly label. • Transferred to Thaketa Support Base (TKA) then immediately continue delivery to either MOGE or Yangon City Development Committee (YCDC) for final disposal.
Hazardous waste	<ul style="list-style-type: none"> • Stored in hazardous waste skip. • Transfer to TKA and continue to DOWA, certified waste management facilities for final disposal.
Food waste	<ul style="list-style-type: none"> • Grinding onsite in compliance with MARPOL and discharge to sea.
Sewage	<ul style="list-style-type: none"> • Treatment onsite in compliance with MARPOL and discharge to sea.
Produced water	<p>Produced water is managed as follows:</p> <ul style="list-style-type: none"> • Control oil and grease content in discharge water not to exceed 42 mg/l daily maximum as required by Myanmar's National Environmental Quality (Emission) Guidelines (EQEG). • Discharge treated produced water to the sea.

Table 1-3 Management of Waste and Wastewater for Offshore Operation

Type of Waste	Waste Management
	<p>(Note: Total Petroleum Hydrocarbon (TPH) onboard analyzer has been provided at ZPQ to ensure that concentration of oil and grease content in water or wastewater is in the discharge limits)</p> <p>Zawtika Produced Water Treatment System treats produced water by the following methods:</p> <ul style="list-style-type: none"> • By removing sand and coarse suspended particles in the produced water from Inlet Separator V-4100 during first stage using two (2x50%) Desander Hydrocyclone HC-6100/6105 with the associated Sand Accumulator Vessels V-6110/6115. Desander shall remove about 99% of particulate larger than 10 micron in produced water. • By removing oil in the produced water from Inlet Separator V-4100 during second stage using two (2x50%) Deoiler Hydrocyclones HC-6130/6140. Oil concentration shall not be more than 40 ppmv in treated water. • By removing gas entrained in produced water in the third stage in one (1x100%) Produced Water Degasser V-6150. Initially, this vessel will perform as a degasser and will be designed so that it can be modified later to be an Induced Gas Floatation Vessel by providing gas spray bubble nozzle flanges and an oil skimming weir and condensate trough without hot work requirement. This is a contingency in case the deoiling hydrocyclones do not perform as expected or the oil in water specification is reduced by local authorities in future. (see V-6150 GA drawing in the attachment). • In addition, water clarifier injection facility has provided at ZPQ lower deck area by utilize the existing chemical pump with tubing connection.
Produced sand	<ul style="list-style-type: none"> • Ship back to shore and dispose by DOWA, the certified waste management contractor.

1.8.7 Utilities

ZPQ facilities contain utility and safety systems to support production operations. Details of each group are discussed in the following sections.

1.8.8 Power and Energy Use

ZPQ is equipped with 3 dual fuel gas turbine power generation units, each of 3.7 MW site rated capacity, which supply all required power to ZPQ and WP1. Multiple gas turbine driven units with adequate capacity to ensure availability of power when a unit is not operational are provided.

A treble fuel design (fuel gas, condensate and diesel) for all three power generation units has been selected, but the connection is made for fuel gas and diesel only. Electric motor start systems are provided for all three power generators.

Emergency diesel power generation of 1.28 MW is provided for essential load in case of turbine generator trip. A black start diesel generator of 280 kW is also provided for initial start.

1.8.9 Water Use

Two reverse osmosis water production units with capacity of 1.5 m³/hr, total 3 m³/hr are provided for fresh water production using RO membrane. The water produced by these units is suitable for consumption, plus other intermittent uses, such as eyewash, safety shower, etc. Fresh water from the fresh water units is supplied and stored in fresh water storage tanks. The stored fresh water is then transferred via pumps to the pressurized fresh water vessel for distribution to various users. Potable water suitable for drinking is supplied after treatment of freshwater by a sterilizer.

Desalinated seawater (freshwater) is stored in an atmospheric storage tank. The tanks (2 x 126 m³ compartments) are sized for the following:

- Average daily fresh water consumption 500 litres /man/day; and
- 7 days storage for maximum continuous consumption of 156 personnel at above rate assuming only one 50% water production unit is available.

1.8.10 Emergency Shutdown System

ZPQ is designed to provide fully automatic, integrated and centralized platform/process control. The control room operator is able to monitor, detect, and handle process upsets from the control room through Process Control system (PCS), Safety Instrument System and Fire and Gas System (SIS and FGS) for facilities on ZPQ, the bridge connected wellhead platform and remote wellhead platforms.

The ZPQ semi-automatic start-up sequences and automatic safe shutdowns are implemented in the control system. Closed circuit television (CCTV) monitors are provided in the control room to monitor critical process equipment/systems. Online analyzers are provided to monitor the content in the feed/sales gas.

1.8.11 Project's Environmental, Social and Health Policies

PTTEPI 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 PTTEPI's SSHE Policy. Proactive individual involvement, responsibility and accountability are expected of all employees, contractors and third party personnel. PTTEPI SSHE Management System (SSHE MS) is designed to align all stakeholders' efforts to enable attainment of these principles.

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

1.8.12 PTTEPI's SSHE Policy

1) PTTEP Corporate Vision

PTTEP will be a leading company that regards SSHE as a license to operate and strives to achieve Safety, Security, Health and Environment (SSHE) excellence by being a zero incident organization.

2) PTTEP Corporate Mission

- Prevent all incidents through operational and process safety management.
- Ensure compliance with and constantly manage and improve our well-established SSHE Management System and its readiness to be able to promptly and effectively respond to emergencies, crises, and security-related events;
- Help to deliver energy reliably and securely by using proven and environmentally friendly technology and by operating responsibly to ensure PTTEP's sustainable development.
- Create a generative SSHE culture that is ground in leadership at every level of the organization, from management to contractors, where everybody understand the crucial importance of SSHE risks, and uncompromisingly manages any SSHE risks in their own working environment;
- Achieve top quartile SSHE performance in exploration and production industry.

3) PTTEPI 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.
- Apply a drug and alcohol-free workplace program to all employees and contractors. The use or possession of drugs and alcohol while working or driving are strictly prohibited.
- 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 analyze 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 are a key successful implementation of this policy which is required from PTTEP employees and contractors at all levels.

1.8.13 PTTEPI'S Environmental, Social and Health Management System

The objective of PTTEPI's SSHE MS is to serve as a practical interpretation of the Company's SSHE policy with respect to their moral obligations for SSHE issues for all persons working on, visiting or affected by operations at sites for which PTTEPI has responsibility.

The manual covers details on the areas specified in Table 1-4. The document is designed to serve as a comprehensive guide for all Operational Assets to develop its own SSHE management system and related documents. This document also provides an overview of the SSHE management system approach. PTTEPI's primary SSHE documents are included in Annex A. Additional SSHE documents are available from PTTEPI upon request as needed.

Table 1-4 PTTEPI SSHE Management System Standards

Document Code	Document
11027-PDR-SSHE-340-003-R01	SSHE Training and Competency Management Standard
11003-STD-SSHE_350-004-R03	SSHE Regulatory Compliance Standard
SSHE-106-PDR-310	SSHE Contractor Management Procedure
11027-PDR-SSHE-401-R02	Working in Adverse Weather Procedure (offshore)
11027-PDR-SSHE-502-006-R00	Myanmar Asset Emergency Management Plan
11027-PDR-SSHE-501-005-R00	Myanmar Asset Crisis Management Plan
Myanmar-0550-PDR-008	PTTEP Crisis Communication Plan
Myanmar-SSHE-11027-PDR-506	Offshore Medical Emergency Response Plan (MERP)
11027-PDR-SSHE-507-R05	Myanmar Asset Tropical Cyclone Procedure
Myanmar-SSHE-11027-PDR-508	Fitness to Work Procedure
11027-PDR-SSHE-501/03-R02	Myanmar Asset Spill Contingency Plan

1.9 Environmental Monitoring and Mitigation Measure Implementation Compliance

According to EIA, the environmental mitigation measures implementation which considered environmental issues and essential impacts that may occur were conducted in the production phase of phase 1C during document review and support photos by PTTEP team. The results were described in Chapter 2. The environmental monitoring measures were implemented during July-December 2020 and the results were presented in Chapter 3 and the conclusion was summarized in Chapter 4.

Chapter 2

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 PTTEPI. The audit conducted against the mitigation measures specified in Environmental Management Plan (EMP) as detailed in Appendix B.

Audit was performed at Zawtika Phase 1C and 1D 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.

The REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions in case there are any non-complicane with the mitigation measures are found during the audit, however the result of the audit presents that PTTEPI have a hundred percent (100%) comply with 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 Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
Environmental Mitigation Measures								
1. Air Quality	1.1 Air Emissions from combustion due to operation of machines and engines installed at offshore facilities, 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.	WPs All project vessels	Throughout operation period	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Figure 2-1 Figure 2-2 and Appendix D-5
	1.2 GHG emissions from the Project may add to global warming issue	1.2.1 Conduct annual pollutant release inventory to monitor the GHG emissions from the Project.	ZPQ WPs All project vessels	Throughout operation period	✓	Annual pollutant release inventory was recorded monthly basis.	-	Appendix D-1
	1.3 Air emission from venting and flaring	1.3.1 Avoid continuous venting and non-routine flaring.	ZPQ WPs	Throughout operation period	✓	Venting and flare was performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup.	-	Figure 2-3 and Appendix D-1
		1.3.2 Utilize excessive gas as much as possible in order to minimize gas flaring.	ZPQ WPs	Throughout operation period	✓	Venting and flare was performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup.	-	Figure 2-3 and Appendix D-1
		1.3.3 In the event of an emergency or equipment breakdown, send excess gas to flare gas system.	ZPQ WPs	Throughout operation period	✓	Venting and flare was performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup.	-	Figure 2-3 and Appendix D-1
		1.3.4 Record the volumes of gas flared for all flaring events.	ZPQ WPs	Throughout operation period	✓	The volumes of gas flared for all flaring events were daily recorded by project staff as shown in ZPQ Daily production and flare record.	-	Appendix D-1
	1.4 Air emission from fugitive emissions	1.4.1 Inspection and maintenance program will be implemented during the operational phase to control fugitive emissions.	ZPQ WPs	Throughout operation period	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Figure 2-1 Figure 2-2 and Appendix D-5

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
2. Seawater & Sediment Quality	2.1 Discharge of oil-containing wastewater (i.e. bilge water, oil-chemical containing wastewater from engine room and deck drain) from offshore facilities may impact seawater quality	2.1.1 Operate offshore facilities in compliance with the requirements under MARPOL 73/ 78 and PTTEPI' s Waste Management Plan (Annex A), including the following:						
		<ul style="list-style-type: none"> Large operating vessels (over 400 gross tons) shall comply with the requirements of MARPOL 73/78. 	All project vessels	Throughout operation period	✓	Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78.	-	Figure 2-4
		<ul style="list-style-type: none"> Oil contaminated bilge water shall be deoiled (i.e. by oil-water separator) prior to discharge into the sea. Discharge water shall contain less than 15 ppm oil content, as per requirements of MARPOL 73/78 Annex IV. 	All project vessels	Throughout operation period	✓	On the vessels, oil separator was provided for treated the oil contaminated bilge water before discharge into sea. The oil content was controlled as per the requirements of MARPOL 73/78 Annex IV.	-	-
		<ul style="list-style-type: none"> Oil-contaminated wastewater separated by the Oil Filtering Equipment on vessels over 400 gross tons shall be stored in appropriate drums for disposal onshore as per MARPOL 73/78 requirements. 	All project vessels	Throughout operation period	✓	Oil-contaminated wastewater was collected in the drum for disposal by onshore contractor, the license waste management service.	-	Figure 2-5 and Appendix C-1
		<ul style="list-style-type: none"> Maintain the cleanness of deck to minimize oil and chemical contamination in rainwater. 	All project vessels	Throughout operation period	✓	Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater.	-	Figure 2-25
		<ul style="list-style-type: none"> Provide drip tray to collect runoff from equipment at all operational areas. Contaminated wastewater shall be treated before discharge to meet MARPOL 73/ 78 requirements prior discharge to sea. 	All project vessels	Throughout operation period	✓	The bun or drip tray was provided at all oil and chemical storage area to collect the contaminated water and sent to treat at wastewater treatment system before discharge to sea.	-	Figure 2-5 and Figure 2-6

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		<ul style="list-style-type: none"> Oil absorbent used in case of spill on deck will be stored onboard and disposed as hazardous waste onshore. 	All project vessels	Throughout operation period	✓	Emergency spill response equipment was provided near all oil and chemical storage area. After usage all were kept in the hazardous waste container and sent to dispose by DOWA, the license waste management service in Myanmar.	-	Figure 2-7 and Appendix C-1
	2.2 Discharge of wastewater and sewage from ZPQ, and WPs, and support vessels may impact seawater quality.	2.2.1 Sewage shall be treated by a wastewater treatment system on vessels 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 and Myanmar's NEQG.	WPs All project vessels	Throughout operation period	✓	Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's NEQG.	-	Figure 2-8
		2.2.2 Routine inspection and maintenance of waste water treatment system to ensure its good treatment efficiency.	WPs All project vessels	Throughout operation period	✓	All equipments of water treatment system were regularly inspected as per the annual PM and Inspection Plan.	-	Appendix D-5
	2.3 Discharge of produced water and produced sand may impact seawater quality.	2.3.1 Record produced water volumes daily at each WPs.	ZPQ WPs	Throughout operation period	✓	Produced water volume was daily recorded from all operation areas as shown in ZPQ Daily production and flare record.	-	Appendix D-1
		2.3.2 Send produced water to treatment system onboard prior discharge to sea. Treated produced water shall contain oil and grease less than 42 mg/ l daily, or 29 mg/ l monthly average as required by Myanmar's NEQG.	ZPQ WPs	Throughout operation period	✓	Produced water was collected to treat at ZPQ, produced water monitoring was conducted everyday to control TOG value as per requirements of Myanmar's EQEG.	-	Appendix E-2

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.3.3 Use Total Petroleum Hydrocarbon (TPH) onboard analyzer to monitor oil and grease content in water or wastewater prior discharge to sea.	ZPQ WPs	Throughout operation period	✓	The TOG/ TPH analyzer was provided at laboratory room on ZPQ to monitor TOG in produced water prior discharge to sea.	-	Figure 2-9 and Appendix C-2
		2.3.4 Follow NEQG regarding produced sand (discharge overboard when % oil concentration less than 1%)	ZPQ WPs	Throughout operation period	✓	Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-10 and Appendix C-1
		2.3.5 Ship produced sand back to shore and dispose by the certified and qualified waste management contractor.	ZPQ WPs	Throughout operation period	✓	Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Appendix C-1 and Appendix C-3
	2.4 Project could generate various types of hazardous and non-hazardous wastes. Inappropriate management (including transportation, storage, and disposal) of waste could impact seawater quality.	2.4.1 Operate Project vessels in compliance with the requirements under MARPOL 73/78 and PTTEPI's Waste Management Plan (Annex A), including the following:						
		<ul style="list-style-type: none"> Hazardous Waste <ul style="list-style-type: none"> Separate hazardous waste from general waste and store in proper labelled container and storage area according to types of wastes. 	All project vessels	Throughout operation period	✓	Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore.	-	Figure 2-5 Figure 2-10 Figure 2-11
		<ul style="list-style-type: none"> Hazardous wastes must be stored in a safe and durable container, suitable for transfer, and be placed in a location far from ignition sources until disposal/ treatment 	All project vessels	Throughout operation period	✓	Hazardous waste container was stored far from the burner area. All containers were sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-5 Figure 2-10 Figure 2-11 and Appendix C-1

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		<ul style="list-style-type: none"> Prohibit any discharge of hazardous waste into the sea. 	All project vessels	Throughout operation period	✓	All hazardous wastes were prohibited discharge into the sea. They were collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Appendix C-1 and Appendix C-3
		<ul style="list-style-type: none"> Used oil and oil-contaminated waste shall be stored separately with labels for disposal onshore or burned at smokeless WP-1 burner. 	All project vessels	Throughout operation period	✓	All used oil and oil-contaminated wastes were stored in the drum or hazardous waste container. They were sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-5 and Appendix C-1
		<ul style="list-style-type: none"> The vessel deck shall be cleaned to minimize the impact from oil and chemical contamination into the sea during periods of rain. 	All project vessels	Throughout operation period	✓	Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater.	-	Figure 2-25
		<ul style="list-style-type: none"> Oil absorbents are required in the case of a small spill and the used absorbent shall be stored in containers onboard and disposed of onshore. 	All project vessels	Throughout operation period	✓	Emergency spill response equipment was already provided near all oil and chemical storage area. After usage, all were kept in the hazardous waste container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-7 and Appendix C-1
		<ul style="list-style-type: none"> Dispose hazardous waste at onshore treatment facilities in accordance with the law of Myanmar and PTTEPI's Waste Management Plan (Annex A). 	All project vessels	Throughout operation period	✓	All hazardous wastes were sent to dispose by DOWA, the license waste management service in Myanmar as per PTTEPI's Waste Management Plan.	-	Appendix C-1 and Appendix C-3
		<ul style="list-style-type: none"> Ensure manifest of hazardous waste is kept. 	All project vessels	Throughout operation period	✓	The manifest for hazardous waste disposal was kept and recorded.	-	Appendix C-3

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		<ul style="list-style-type: none"> • Non-Hazardous Waste <ul style="list-style-type: none"> ○ Segregate non- hazardous waste including food waste, paper, aluminium can, glass, rag and other wastes in separate containers or proper areas. 	All project vessels	Throughout operation period	✓	Non- hazardous wastes were segregated as food waste, paper, recycle waste and other waste and kept in the bins attached with colour code.	-	Figure 2-11
		<ul style="list-style-type: none"> ○ Grind food waste to a size less than 25 mm before discharge into the sea at a distance of 12 nautical miles (22.22 km) from shore, in a location that is not located in coral reef area, according to the requirements under MARPOL 73/78. 	All project vessels	Throughout operation period	✓	The food waste was grinded to a size less than 25 mm before discharge into the sea as per the requirements under MARPOL 73/78.	-	Figure 2-12
		<ul style="list-style-type: none"> ○ Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels. 	All project vessels	Throughout operation period	✓	Hazardous wastes were collected in the red container separated from the general waste which was collected in the blue ones. At waste storage area was attached with the clearly information board for waste segregation.	-	Figure 2-5 Figure 2-10 and Figure 2-11
		<ul style="list-style-type: none"> ○ Dispose non-hazardous waste at onshore treatment facilities in accordance with the law of Myanmar and PTTEPI's Waste Management Plan (Annex A). 	All project vessels	Throughout operation period	✓	Non- hazardous wastes were sent to dispose at onshore as per PTTEPI's Waste Management Plan.	-	Figure 2-11 Appendix C-1 and Appendix C-3
		<ul style="list-style-type: none"> ○ Keep the records of waste inventories including types and quantities updated. 	ZPQ All project vessels	Throughout operation period	✓	All waste was recorded regularly when sent to dispose at onshore.	-	Appendix C-4

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
3. Marine Life and Marine Ecology	3.1 Discharge of oil-containing wastewater (i.e. bilge water, oil-chemical containing wastewater from engine room and deck drain) from vessels and ZPQ and WPs, may impact seawater and sediment quality, which could have secondary impacts to marine ecology and biodiversity.	3.1.1 Implement all mitigation measures for Item 2.1 above.	WPs All project vessels	Throughout operation period	✓	Same as item 2.1	-	Same as item 2.1
	3.2 Discharge of wastewater and sewage from ZPQ, and WPs, and support vessels may impact seawater and sediment quality, which could have secondary impacts to marine ecology and biodiversity.	3.2.1 Implement all mitigation measures for Item 2.2 above.	WPs All project vessels	Throughout operation period	✓	Same as item 2.2	-	Same as item 2.2
	3.3 Discharge of produced water may impact seawater quality, which could have secondary impacts to marine ecology and biodiversity.	3.3.1 Implement all mitigation measures for Item 2.3 above.	ZPQ WPs	Throughout operation period	✓	Same as item 2.3	-	Same as item 2.3

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
	3.4 Project could generate various types of hazardous and non-hazardous wastes. Inappropriate management (including transportation, storage, and disposal) of waste could impact seawater and sediment quality, which could have secondary impacts to marine ecology and biodiversity.	3.4.1 Implement all mitigation measures for Item 2.4 above.	WPs All project vessels	Throughout operation period	✓	Same as item 2.4	-	Same as item 2.4
Social Mitigation Measures								
4. Fishing	4.1 Reduced fishing area due to presence of platforms and ZPQ.	4.1.1 Establish 500 m safety zone around the ZPQ and WPs.	WPs All project vessels	Throughout operation period	✓	ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned.	-	Figure 2-13 and Figure 2-14
		4.1.2 Use support vessels to warn off traffic.	WPs All project vessels	Throughout operation period	✓	Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs.	-	Figure 2-4
		4.1.3 Provide appropriate lights and warning signals on ZPQ and WPs and all vessels to prevent accidental collision.	WPs All project vessels	Throughout operation period	✓	The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.	-	Figure 2-15

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		4.1.4 Develop and communicate a Grievance Mechanism for fishing community to report grievance regarding Project activities	Fishing Community	Throughout operation period	✓	The PTTEPI Grievance Handling Guideline was already provided to respond the complaint issue from project activities.	-	
5. Shipping and Navigation	5.1 The presence of the offshore facilities and may obstruct navigation.	5.1.1 Implement all mitigation measures for Item 4.1 above.	WPs All project vessels	Throughout operation period	✓	Same as Item 4.1	-	Same as Item 4.1
Health Mitigation Measures								
6. Occupational Health and Safety	6.1 Injuries or illness due to exposure to harmful substances or accident	6.1.1 Implement relevant components of PTTEPI's SSHE Management System (Annex A), including the following:	ZPQ WPs All project vessels	Throughout operation period	✓	PTTEPI's Occupational Health Management Standard was prepared and applied for Zawtika project.	-	-
		o Implement PTTEPI's Occupational Health Management Standard.						
		o Ensure that all employees wear appropriate PPE and implement PTTEPI's Personal Protective Equipment Standard.	ZPQ WPs All project vessels	Throughout operation period	✓	All staffs wear appropriate PPE at all working time.	-	Figure 2-16
		o Personnel will be provided with safety training to ensure that all workers practice under safety operation and regulation of work, as per PTTEPI's SSHE Training & Competency Standard.	ZPQ WPs All project vessels	Throughout operation period	✓	The safety training schedule was performed as per SSHE annual training plan.	-	Appendix D-3
		o Implement PTTEPI's Safety Case Standard.	ZPQ WPs All project vessels	Throughout operation period	✓	The safety case or emergency drill was performed as per SSHE Emergency Drill & Exercise Plan.	-	Appendix D-4

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		o Implement PTTEPI's Life Saving Program Standard.	ZPQ WPs All project vessels	Throughout operation period	✓	Life saving program standard was specified in Zawtika Offshore Field Emergency Response Plan and others related plan.	-	-
		o Implement PTTEPI's Offshore Medical Emergency Response Plan (MERP).	ZPQ WPs All project vessels	Throughout operation period	✓	The Offshore Medical Emergency Response Plan (MERP) was already implemented.	-	-
		o Implement PTTEPI' s Crisis Communications Plan.	ZPQ WPs All project vessels	Throughout operation period	✓	The Myanmar Asset Crisis Management Plan was already implemented.	-	-
		6.1.2 Provide first-aid kits and first-aid rooms on ZPQ.	ZPQ WPs All project vessels	Throughout operation period	✓	First- aid kits and medic room were already provided. The medic was stand by at medic room for medical treatment.	-	Figure 2-17
		6.1.3 Provide proper sanitary systems including drinking water, potable water, toilet, and waste management.	ZPQ WPs All project vessels	Throughout operation period	✓	The proper sanitary systems including drinking water, potable water, toilet, and waste management were already provided.	-	Figure 2-18
		6.1.4 Cooperate with the nearest health center/hospital in order to immediately support response to emergency events, as per PTTEPI's MERP (Annex A).	ZPQ WPs All project vessels	Throughout operation period	✓	In case of emergency, the patient will be pre-treatment by medic and will sent to the hospital in Yangon by helicopter as per The Offshore Medical Emergency Response Plan (MERP).	-	-
		6.1.5 Safety method for working with machines/equipment	ZPQ WPs All project vessels	Throughout operation period	✓	Safety method for working with machines/ equipment were implemented.	-	Appendix D-2
		6.1.6 Procedure for safety operation	ZPQ WPs All project vessels	Throughout operation period	✓	The procedure for safety operation was already implemented.	-	Appendix D-2

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		6.1.7 Provide SDS for all chemicals	ZPQ WPs All project vessels	Throughout operation period	✓	The SDS was attached at all chemical storage area.	-	Figure 2-19
	6.2 Injuries due to working in noisy areas	6.2.1 Carry out routine inspection and preventive maintenance for all machinery as per maintenance schedule/ recommended by manufacturers.	ZPQ WPs All project vessels	Throughout operation period	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Figure 2-1 Figure 2-2 and Appendix D-5
		6.2.2 Provide personal protection equipment (PPEs/ ear muff/ ear plug) to workers working on high level noise activities.	ZPQ WPs All project vessels	Throughout operation period	✓	The appropriate PPEs were already provided to workers working on high level noise activities.	-	Figure 2-16
		6.2.3 Provide warning labels/ signs and limit working duration in high noise area.	ZPQ WPs All project vessels	Throughout operation period	✓	The warning signs were already provided at high noise area.	-	Figure 2-20

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
1. Vessel Collision	1.1 Collisions could potentially occur during transport of materials and rig tow-out.	1.1.1 Implement PTTEPI's SSHE Management System, including the following: ○ In case of vessel collision, follow PTTEPI's Emergency and Crisis Management Plan, including procedures in the event of an accidental vessel collision.	All project vessels Drilling rig	Throughout project duration	✓	PTTEPI's Emergency and Crisis Management Plan was implemented which the procedures in the event of an accidental vessel collision was included.	-	-
		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).	All project vessels Drilling rig	Throughout project duration	✓	The notice to mariner was already submitted to government authorities after rig mobilization.	-	Appendix D-7
		1.1.3 Establish 500 m safety zone around WPs;	All project vessels Drilling rig	Throughout project duration	✓	ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned.	-	Figure 2-13 and Figure 2-14
		1.1.4 Use support vessels to warn off traffic.	All project vessels Drilling rig	Throughout project duration	✓	Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs.	-	Figure 2-4
		1.1.5 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	All project vessels Drilling rig	Throughout project duration	✓	The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.	-	Figure 2-15

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
2. Accidental Spills	2.1.4 Accidental spills of drilling fluids, chemicals, or diesel fuel could occur throughout all Project phases, and they may directly affect surface water quality, and indirectly affect sediment quality and marine ecology.	2.1.1 Implement the relevant components of PTTEPI's SSHE Management System, including the following: <ul style="list-style-type: none"> PTTEPI Emergency and Crisis Management Plan (in case of oil or chemical spills). PTTEPI Spill Contingency Plan. PTTEPI SSHE Training & Competency Standard. PTTEPI Incident Management Standard. PTTEPI Waste Management Plan. 	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	<ul style="list-style-type: none"> PTTEPI's Emergency and Crisis Management Plan was already implemented which the oil or chemical spills was included. The exercise of oil or chemical spills was regularly performed. The incident and nearmiss record was collected by project staffs. The waste management procedure was already implemented and followed. 	-	Appendix D-3 Appendix D-6
		2.1.2 Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/ procedures (MARPOL 73/78 requirements, PTTEPI and contractor procedures).	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78.	-	Figure 2-4
		2.1.3 Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78.	-	Figure 2-4
		2.1.4 Separate and store chemicals according to their characteristics.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The chemical was separated to store according to their characteristics.	-	Figure 2-26

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.1.5 Store only necessary amounts of lubricants, fuels, paints, and other chemicals.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The lubricants, fuels, paints and other chemicals were stored only necessary amounts at operation area.	-	Figure 2-26
		2.1.6 In case an oil spill accident on the drilling rig, must recover and properly clean the oil contaminated area (such as clean with absorbent etc.) and collect all materials contaminated with oil to dispose of onshore.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	NA	There is no oil spill accident reported for the production phase during Jan-Jun 2020.	-	-
		2.1.7 The ZPQ, WPs and rig shall be provided with drip tray to prevent oil and chemical spills. Any spilled oil and chemical will be collected into a sealed container.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The bun or dip tray was already provided at all oil and chemical storage area. Any spilled oil and chemical was collected into drum and sent to dispose by DOWA, the license waste management service in Myanmar.	-	Figure 2-5 and Figure 2-26
		2.1.8 Regularly monitor safety zone within 500 m radius surrounding ZPQ, WPs and rig to prevent any accidents.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned.	-	Figure 2-5
		2.1.9 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The appropriate lights and warning signals were already provided on ZPQ, WPs and all vessels to prevent accidental collision.	-	Figure 2-15

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.1.10 Conduct routine inspections for any leakage and damages, and preventative maintenance of equipment/facilities used in fluid storage (fuel, oil, chemicals, etc).	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Appendix D-5
		2.1.11 Conduct exercises according to Emergency Response Plan and Tropical Storm Emergency Plan.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Tropical Cyclone Procedure was implemented including the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.	-	Appendix D-3
		2.1.12 Use the appropriate well Plug & Abandonment method in order to prevent the leakage of petroleum hydrocarbons and other compounds from well.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Plug & Abandonment (P&A) Guideline was implemented to prevent the leakage of petroleum hydrocarbons and other compounds from well.	-	-
		2.1.13 Ensure proper training in the use and handling of the relevant chemicals and standard safety procedures implemented by all contractors.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Chemical Management Standard was implemented. Also, the training was regularly performed as per the SSHE Training Plan.	-	Appendix D-3
		2.1.14 Provide spill clean up kits.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Oil absorbent kits was provided near all oil and chemical storage area.	-	Figure 2-7
		2.1.15 Handle all chemicals according to their SDS.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The SDS was attached at all chemical storage area.	-	Figure 2-19
		2.1.16 Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore.	-	Figure 2-11 and Appendix C-3

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.1.17 Ensure manifest of hazardous waste is kept	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The manifest for hazardous waste disposal was kept and recorded.	-	Appendix C-3
		2.1.18 Install an appropriate control valve for pipe work relating to chemical and fuel transfer. Perform valve inspection and conduct a pressure test as required.	Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	The control valve was already installed and monitored by control room. The inspection was performed regularly as per the annual PM and Inspection Plan.	-	Figure 2-21, Figure 2-22 and Appendix D-5
3. Well Blowout	3.1 A blowout can result in the release of hydrocarbons (oil or gas) 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 PTTEPI's SSHE Management System, including the following: <ul style="list-style-type: none"> PTTEPI's Blowout Contingency Plan. In case of oil or chemical spills, follow PTTEPI's Emergency and Crisis Management Plan. PTTEPI's Spill Contingency Plan. PTTEPI's SSHE Requirement for Contractor. PTTEPI's SSHE Training and Competency Management Standard. PTTEPI's Incident Management Procedure. PTTEPI's Offshore Medical Emergency Response Plan (MERP). PTTEPI's Crisis Communication Plan and Crisis Management Plan. 	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2020.	-	-
		3.1.2 Install blowout preventer and shear ram appropriately.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2020.	-	-

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		3.1.3 Employ experienced drilling contractors that have well maintained equipment and train their employees regarding inspection and prevention of blowouts.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2020.	-	-
		3.1.4 Ensure that drilling contractors develop and maintain emergency plans, have equipment that are readily available for use, and their personnel are trained to respond to oil spill.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2020.	-	-
		3.1.5 Monitor down-hole pressure at all times.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2020.	-	-
		3.1.6 Conduct regular trainings and spill response drills at least once a year.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2020.	-	-
		3.1.7 Prepare and maintain oil spill response equipment for Tier I spill that is ready to use at all times.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2020.	-	-
4. Tropical Cyclone	4.1 Tropical cyclones represent a threat to the safety of offshore personnel and could result in multiple fatalities and damage to assets.	4.1.1 Implement PTTEPI's Tropical Revolving Storm Procedure and Emergency and Crisis Management Plan (Annex A).	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Tropical Cyclone Procedure was implemented. Also, the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.	-	Appendix D-3

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
5. Fire or Explosion	5.1 Fire or explosion could potentially impact air quality, health and safety concerns to PTTEPI's employees and contractors, and damage to structures. Secondary impacts from release/spill of chemicals could occur to seawater/sediment quality, ecology and biodiversity.	5.1.1 Provide fire protection equipment, including fire extinguishers and alarms, on all offshore facilities.	Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	The firefighting equipments and alarm were provided in the area and regularly inspected by operators.	-	Figure 2-23, Figure 2-24 and Appendix D-5
		5.1.2 Conduct regular inspections and drills for fire protection equipment.	Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	The firefighting equipments and alarm were provided in the area and regularly inspected by operators. The emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.	-	Figure 2-1, Figure 2-23, Figure 2-24 and Appendix D-4
		5.1.3 Implement Emergency and Crisis Management Plan (Annex A) in case of fire or explosion occurrence.	Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	PTTEPI's Emergency and Crisis Management Plan was implemented in case of fire or explosion occurrence.	-	



Figure 2-1 Inspection tag on equipment



Figure 2-2 Maintenance activities by project' staffs



Figure 2-3 Flare at ZPQ platform



Figure 2-4 Support vessel of the project



Figure 2-5 Used oil, chemical and hazardous waste storage area



Figure 2-6 Wastewater treatment system



Figure 2-7 Emergency spill response equipment



Figure 2-8 Sewage treatment system

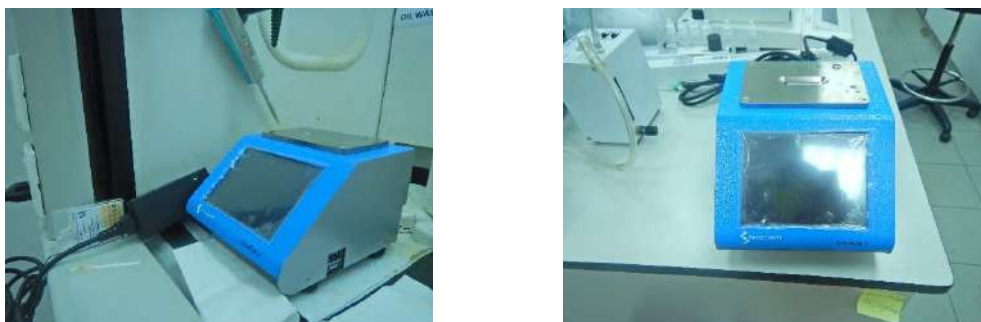


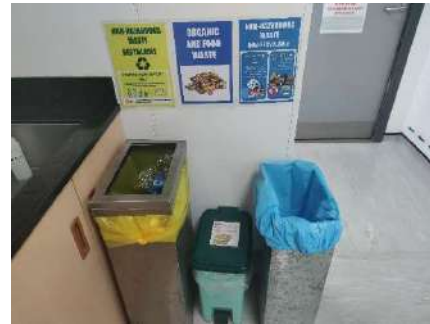
Figure 2-9 TOG/TPH analyzer



Figure 2-10 Produced sand containers



Toner cartridges and Battery Waste disposal bin



Non-Hazardous and Food Waste disposal bin



Hazardous waste container



Non-hazardous waste containers



Figure 2-11 Waste containers



Figure 2-12 Food waste grinder



Figure 2-13 Safety zone monitoring display

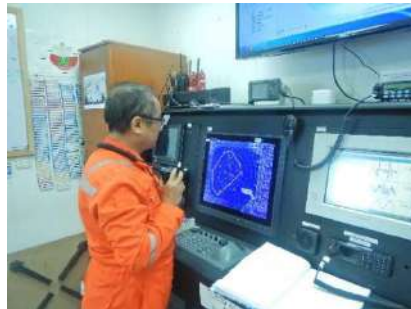


Figure 2-14 Radio room at ZPQ



Figure 2-15 Light and warning signal at ZPQ and WPs

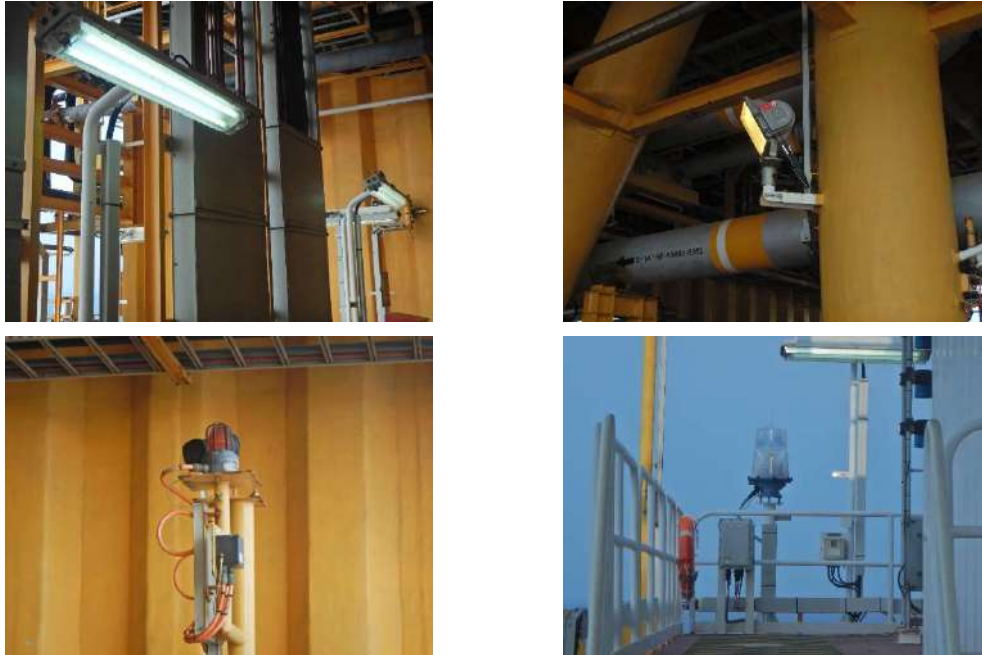


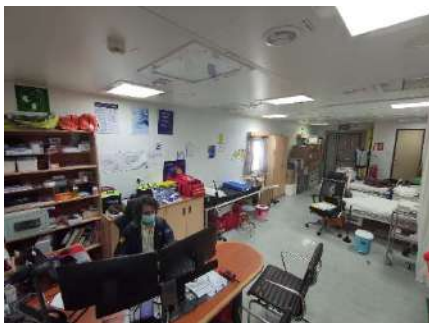
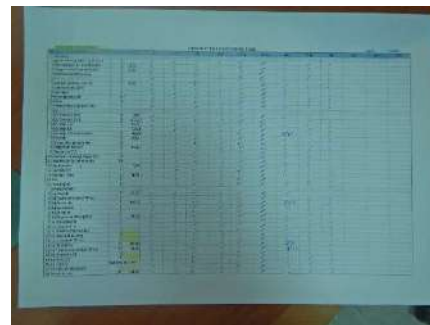
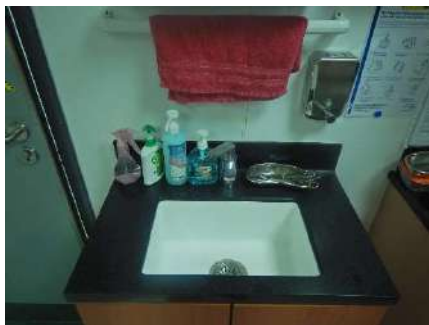
Figure 2-15 (Cont.) Light and warning signal at ZPQ and WPs



Figure 2-16 Provided PPE and PPE wearing



First-aid kits



Medical room

Figure 2-17 First-aid kits and medic room



Drinking water and Coffee corner



Mess room



Toilets

Figure 2-18 Provided sanitary systems and facilities



Bedroom



Pool Table



Gym room



TV room



Washing service

Figure 2-18 (Cont.) Provided sanitary systems and facilities



Figure 2-19 SDS at chemical storage area

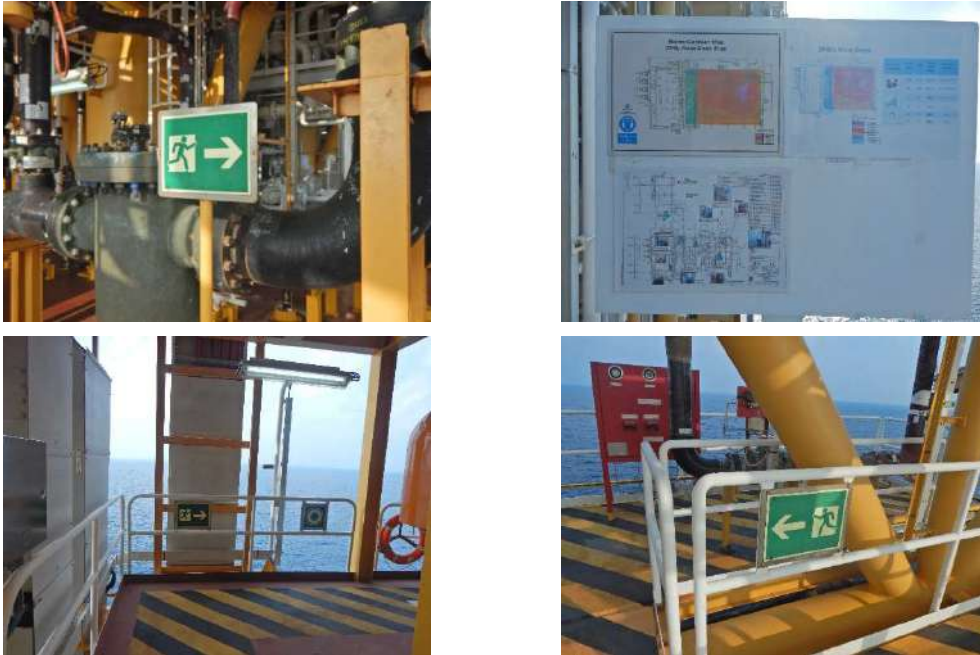


Figure 2-20 Warning signs

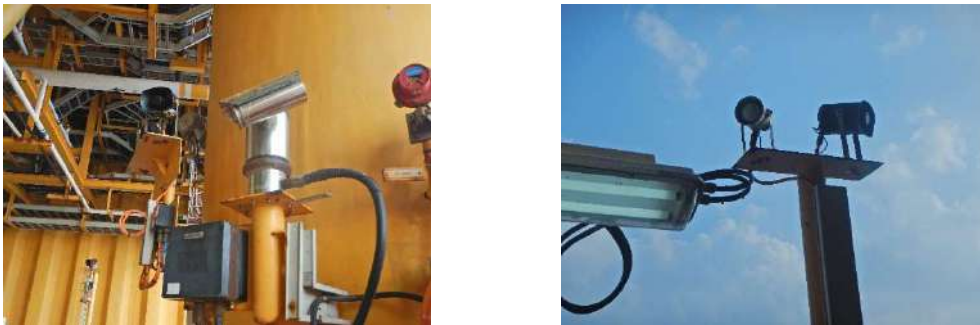


Figure 2-21 CCTV



Figure 2-22 Control room



Figure 2-23 Alarm and detector equipment



Figure 2-24 Firefighting equipment

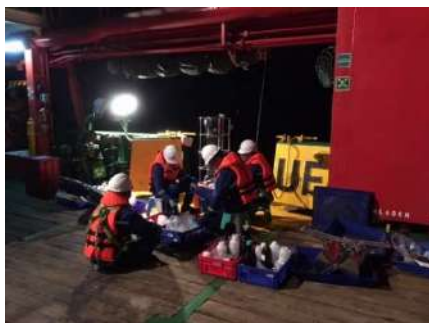


Figure 2-25 Vessel deck



Figure 2-25 (Cont.) Vessel deck



Figure 2-26 Chemical Storage Area

Chapter 3

Chapter 3

Environmental Monitoring Results

Environmental monitoring was conducted as specified in EIA Report 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 Zawtika Phase 1C and 1D Development Project during production phase, the detail is presented as follow;

3.1 Environmental Monitoring Plan

Environmental monitoring for Zawtika Phase 1C and 1D Development Project during production phase is shown in Table 3-1.

Table 3-1 Environmental Monitoring Plan of Zawtika Phase 1C and 1D Development Project during Production Phase

Environmental Quality	Parameter	Period/Frequency	Location	Implemented	
				Complied	Not complied
1. Sewage	<ul style="list-style-type: none"> pH BOD COD Total Coliform Bacteria 	Once every 6 months	Sampling from sewage water treatment system discharge point	<ul style="list-style-type: none"> Monitored by REM- UAE Laboratory and Consultant Co., Ltd. on July 21, 2020. The result as shown in Content 3.2.5. 	-
2. Produced water	<ul style="list-style-type: none"> Oil & Grease 	<ul style="list-style-type: none"> Monthly summary of volume discharged Daily onboard Analysis/ Monitoring for Oil and Grease 	Sampling from Produced Water treatment system discharged point	<ul style="list-style-type: none"> Monitored by REM- UAE Laboratory and Consultant Co., Ltd. during July to December 2020. The result as shown in Content 3.3.5. 	-
3. Produced sand	<ul style="list-style-type: none"> OOO% (only in case of discharge) 	Analysis/monitoring as required	Sampling from produced sand container	<ul style="list-style-type: none"> Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar. The result as shown in Content 3.4.5. 	-

3.2 Sewage Monitoring

Sewage monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on July 21, 2020 from sewage water treatment system discharge point at ZPQ. The detail as shown in Table 3-2.

Table 3-2 Sewage Water Quality Monitoring Plan

Environmental Quality	Parameter	Location	Period
Sewage	1. pH 2. BOD 3. COD 4. Total Coliform Bacteria	Sewage water treatment system discharge point at ZPQ	July 21, 2020

3.2.1 Sewage Analysis Method

Details of sewage monitoring including parameters and analysis methods are shown in Table 3-3.

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

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

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

3.2.2 Sewage Monitoring at ZPQ

Sewage samples were collected at effluent from sewage water treatment from project area on July 21, 2020 at discharge point. The sewage water sample was shown in Figure 3-1.



Figure 3-1 Sewage Water Sample from ZPQ

3.2.3 Preservation Methods

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

Table 3-4 Container and Preservation Methods of Sewage Monitoring

Parameter	Container	Preservation Methods*
1. pH	-	Measuring at Site
2. BOD	Polyethylene Bottle 1 L	Refrigerate at $>0^{\circ}\text{C}$, $\leq 6^{\circ}\text{C}$
3. COD	Glass Bottle 250 mL	Add H_2SO_4 to $\text{pH}<2$ and Refrigerate at $>0^{\circ}\text{C}$, $\leq 6^{\circ}\text{C}$
4. Total Coliform Bacteria	Sterile, Brown Glass Bottle 150 mL	Add 10% $\text{Na}_2\text{S}_2\text{O}_3$ 0.1 mL/100 mL and Refrigerate at $< 10^{\circ}\text{C}$ (above freezing point of water)

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

3.2.4 Sewage Monitoring Result

Referring to analysis number LAA134/2020, sewage sample was conducted on July 21, 2020 during production phase of ZPQ. The result found that all of parameters complied with MARPOL73/78 as specified in National Environmental Quality (Emission) Guidelines. Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's EQEG.

From Table 3-5, It was found that the monitoring result in July 2020 was complied with MARPOL73/78 as specified in National Environmental Quality (mission) Guidelines. PTTEPI will continually monitor sewage, as specified in the measure for surveillance of environmental impact from project operation. The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix E, F and G.

Table 3-5 Results of Sewage Monitoring at ZPQ

Parameter	Unit	The Results of Sewage Quality	Guideline ^{1/}	Detection Limit
		July 21, 2020		
pH	-	8.4 (25°C)	6-9	-
BOD	mg/L	ND (<2.0)	50	2.0
COD	mg/L	108	250	25.0
Total Coliform Bacteria	MPN/100 ml	4.5	400	1.8
Sample condition				
Water's Colour/Turbid	-	Light Grey/Little Turbid	-	-
Sediment	-	Grey	-	-

Remark: ^{1/} National Environmental Quality (Emission) Guidelines. Compliance with MARPOL 73/78

3.3 Produced Water Monitoring

Produced water monitoring at ZPQ as per specified in EMP was conducted by REM-UAE Laboratory and Consultant Company Limited in production phase. The detail as shown in Table 3-6.

Table 3-6 Produced Water Monitoring Plan

Environmental Quality	Parameter	Location	Period
Produced water	Oil & Grease	Produced Water treatment system discharged point	July 2020 August 2020 September 2020 October 2020 November 2020 December 2020

3.3.1 Produced Water Analysis Method

Details of produced water monitoring including parameters and analysis methods are shown in Table 3-7.

Table 3-7 Parameters and Analyses Methods for Produced Water Monitoring

Parameter	Analysis Method ^{1/}
Oil & Grease	Partition-Gravimetric Method (SM 2017 : 5520 B)

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

3.3.2 Produced Water Monitoring at ZPQ

Produced water monitoring at ZPQ was conducted from Produced Water treatment system discharged point during July to December, 2020. The produced water sample from ZPQ was shown in Figure 3-2.



Figure 3-2 Produced Water Sample from ZPQ

3.3.3 Presevation Methods

All samples were preserved with specific procedure and storage as shown in Table 3-8.

Table 3-8 Container and Preservation Methods of Produced Water Monitoring

Parameter	Container	Preservation Methods*
Oil & Grease	Glass wide Mouth Bottle 1 L	Add H ₂ SO ₄ to pH<2 and Refrigerate at >0°C, ≤6 °C

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

3.3.4 Produced Water Results

Referring to analysis report of produced water which were collected during July to December 2020 The results found that oil and grease were complied with National Environmental Quality Emission Guidelines. Produced water monitoring results were shown in Table 3-9.

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

Table 3-9 The Results of Produced Water Monitoring

Parameter	Unit	The Results of Produced Water						Guideline ^{1/}		Detection Limit
		July 2020	August 2020	September 2020	October 2020	November 2020	December 2020	1 Day	30 Days	
Oil & Grease ^v	mg/L	6	No produced water discharged	9	9	10	10	42	29	3
Sample condition										
Water's Colour/Turbid	-	Brown/Turbid	-	Brown/Turbid	Brown/Turbid	Brown/Turbid	Brown/Turbid	-	-	-
Sediment	-	Brown	-	Brown	Brown	Brown	Brown	-	-	-

Remark: ^{1/} Re-inject, discharge to sea maximum one day oil and grease discharge should not exceed 42 mg/L; 30 day average should not exceed 29 mg/L following National Environmental Quality (Emission) Guidelines.

3.4 Produced Sand Monitoring

Produced sand was collected in the proper container (UN drum) and sent to dispose at onshore facility which is DOWA, the license waste management service in Myanmar.

Chapter 4

Chapter 4

Environmental Mitigation Measures Compliance Audit and Environmental Monitoring Conclusion

From the implementation of Environmental Mitigation Measures Compliance Audit and Environmental Monitoring of Zawtika Phase 1C and 1D in Production Period, it was found that the project has implemented the measures as specified in EMP and the results are summarized as following details:

4.1 Environmental Mitigation Measures Compliance Audit and Environmental Monitoring Conclusion

Environmental Mitigation Measures Implementation Compliance audit was carried out by REM- UAE Laboratory and Consultant Company Limited together with representatives from PTTEPI. The audit conducted against the mitigation measures specified in Environmental Management Plan.

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

The REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions in case there are any non-compliance with the mitigation measures are found during the audit.

The results determined that the project completely complied on the Mitigation Measures for production phase and the unplanned events with 100% for the activities that have situation. The results are shown in Figure 4-1 and Figure 4-2.



Figure 4-1 The Results of Environmental Mitigation Measures Compliance during Production Phase

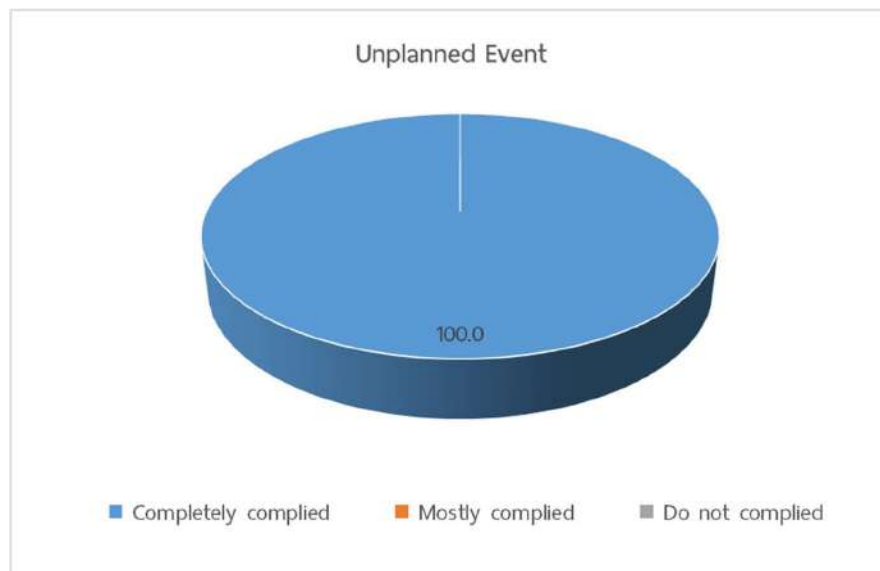


Figure 4-2 The Results of Environmental Mitigation Measures Compliance in Unplanned Events

4.1.1 Environmental Mitigation Measures Compliance Result in Production Phase

- **Air Quality** - Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. Annual pollutant release inventory was recorded monthly basis. Moreover, venting and flare were performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup. The volumes of gas flared for all flaring events were daily recorded by project staff.
- **Seawater & Sediment Quality** - Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78. Oil-contaminated wastewater was collected in the drum for disposal by onshore contractor, the license waste management service. Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater. Emergency spill response equipment was provided near all oil and chemical storage area. After usage all were kept in the hazardous waste container and sent to dispose by DOWA, the license waste management service in Myanmar.
- **Marine Life and Marine Ecology** - Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's NEQG. All equipment of water treatment system were regularly inspected as per the annual PM and Inspection Plan.

Produced water was collected to treat at ZPQ and monitored every day to control TOG value as per requirements of Myanmar's EQEG. Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.

Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded.

Furthermore, non-hazardous wastes were segregated as food waste, paper, recycle waste and other waste and kept in the bins attached with colour code. The food waste was grinded to a size less than 25 mm before discharge into the sea as per the requirements under MARPOL 73/78. All wastes were recorded regularly when sent to dispose at onshore.

- **Fishing** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. In addition, support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.

- **Shipping and Navigation** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.

Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document.

- **Occupational Health and Safety** - PTTEPI's Occupational Health Management Standard was prepared and applied for Zawtika project. All staffs wear appropriate PPE at all working time. The safety training schedule was performed as per SSHE annual training plan. The safety case or emergency drill was performed as per SSHE Emergency Drill & Exercise Plan. Life saving program standard was specified in Zawtika Offshore Field Emergency Response Plan and others related plan. Offshore Medical Emergency Response Plan (MERP) and Myanmar Asset Crisis Management Plan were already implemented. First-aid kits and medic room were provided. The medic was stand by at medic room for medical treatment. In case of emergency, the patient will be pre-treatment by medic and will sent to the hospital in Yangon by helicopter as per The Offshore Medical Emergency Response Plan (MERP). Safety method for working with machines/ equipment and procedure for safety operation were already implemented. The SDS was attached at all chemical storage area.
- There were total 3 cases of incident during July to December 2020 including 2 case of first aid case (FAC) and 1 case of LOPC. Corrective actions were proposed/implemented to prevent reoccurrence. The summary of incident record as shown in Appendix D-6.

4.1.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

- **Vessel collision** - PTTEPI's Emergency and Crisis Management Plan was implemented which the procedures in the event of an accidental vessel collision was included. The notice to mariner was already submitted to government authorities after rig mobilization. ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.
- **Accidental Spills** - PTTEPI's Emergency and Crisis Management Plan was already implemented which the oil or chemical spills was included. The exercise of oil or chemical spills was regularly performed. The incident and near miss record were collected by project staffs. Waste management procedure was already implemented and followed. The chemical was separated to store

according to their characteristics. The lubricants, fuels, paints and other chemicals were stored only necessary amounts at operation area. The bun or dip tray was already provided at all oil and chemical storage area. Any spilled oil and chemical were collected into drum and sent to dispose by DOWA, the license waste management service in Myanmar. The appropriate lights and warning signals were already provided on ZPQ, WPs and all vessels to prevent accidental collision. Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. The Tropical Cyclone Procedure was implemented including the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. The SDS was attached at all chemical storage area. Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded. The control valve was already installed and monitored by control room. The inspection was performed regularly as per the annual PM and Inspection Plan.

- **Tropical cyclone** - The Tropical Cyclone Procedure was implemented. Also, the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.
- **Fire or Explosion** - The firefighting equipment and alarm were provided in the area and regularly inspected by operators. The emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. PTTEPI's Emergency and Crisis Management Plan was implemented in case of fire or explosion occurrence. The firewater system was regularly inspected by operator. Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document. The air consumption of the burner package was checked by operator to ensure adequate air flow as per the Liquid Burner Operation Procedure. The gas detection system was installed at WP-1 and regularly checked by operator. The alarm was monitored by control room. The CCTV was already installed at burner area and monitored by control room.

4.2 Environmental Monitoring Conclusion

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

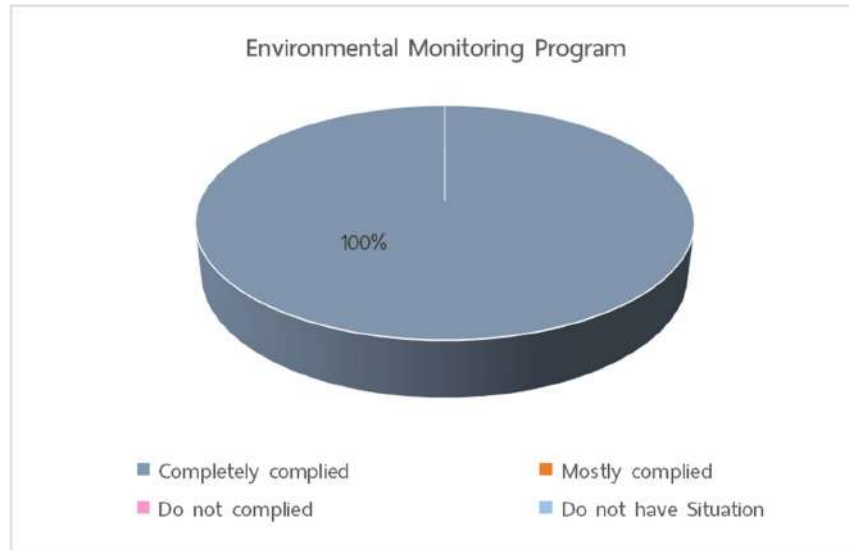


Figure 4-3 The Results of Environmental Monitoring

Sewage Monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on July 21, 2020 from sewage treatment system discharge point at ZPQ. The result found that all of parameters complied with MARPOL73/78 as specified in National Environmental Quality (Emission) Guidelines.

4.2.1 Produced Water Monitoring

Produced water monitoring at ZPQ was conducted from Produced Water treatment system discharged point during July to December 2020. The results found that oil and grease were complied with National Environmental Quality (Emission) Guidelines.

4.2.2 Produced Sand Monitoring

Produced sand was collected in the proper container (UN drum) and sent to dispose at onshore facility which is DOWA, the license waste management service in Myanmar.